Promoting Scientific Creativity by Utilising Web-based Research Objects

Project acronym: Dr Inventor

Deliverable No. 9.4
Last year dissemination and exploitation report

Grant agreement no: 611383

Dissemination Level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

COVER AND CONTROL PAGE OF DOCUMENT	
Project Acronym:	Dr Inventor
Project Full Name:	Promoting Scientific Creativity by Utilising Web-based Research Objects
Deliverable No.:	D 9.4
Document name:	Last year dissemination and exploitation report
Nature (R, P, D, O)[1]	R
Dissemination Level (PU, PP, RE, CO)[2]	PU
Version:	2
Actual Submission Date:	31/03/2017
Editor: Institution: E-Mail:	Jian Jun Zhang Bournemouth University, UK jzhang@bournemouth.ac.uk

ABSTRACT:
This report gives a detailed description of the project dissemination and exploitation activities of Dr Inventor project. This deliverable D9.4 "last year dissemination and exploitation report", describes dissemination strategy and identifies channels of communication that have been used by the project consortium to achieve the goal of informing all relevant target groups about the project's vision, its results.

KEYWORD LIST:
Dissemination, dissemination activities, exploitation, social media, audiences, website, publication, workshop, conference.

[1] **R**=Report, **P**=Prototype, **D**=Demonstrator, **O**=Other

[2] **PU**=Public, **PP**=Restricted to other programme participants (including the Commission Services), **RE**=Restricted to a group specified by the consortium (including the Commission Services), **CO**=Confidential, only for members of the consortium (including the Commission Services)

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7-ICT-2013.8.1) under grant agreement nº 611383.

MODIFICATION CONTROL			
Version	**Date**	**Status**	**Author**
1.0	03/02/2017	Draft	E. Chaudhry
1.0	23/02/2017	Draft	J. Zhang
1.0	13/03/2017	Draft	X. Yang
1.0	17/03/2017	Draft	E. Chaudhry
2.0	13/04/2017	Draft	J. Zhang
2.0	25/04/2017	Draft	J. Zhang

List of Contributors

- E. Chaudhry, Bournemouth University, UK
- Jean-Michel Careil, Questel, France
- X. Yang, Bournemouth University, UK
- J. Zhang, Bournemouth University, UK
- F. Dong, University of Bedfordshire, UK
- Diarmuid P. O'Donoghue, Maynooth University, Ireland
- Oscar Corcho, Universidad Politécnica de Madrid, Spain
- Carlos Badenes, Universidad Politécnica de Madrid, Spain
- Horacio Saggion, Pompeu Fabra University, Spain
- Francesco Ronzano, Pompeu Fabra University, Spain

List of Internal Reviewer's

- F. Dong, University of Bedfordshire, UK
- Babak Mahdian, ImageMetry, Czech Republic

Contents

1 Executive Summary

Dissemination activities constitute a key area of effort within Dr Inventor project. This report presents the dissemination and exploitation activities of the final year of Dr Inventor project, which has been undertaken by the consortium during the project, as well as after it finishes. At the beginning of Dr Inventor project, dissemination strategy was planned to identify target audiences and intended key messages, and recruiting a rich set of suitable and effective communication channels. The following are the dissemination strategies that are supported by the entire consortium:

- To establish communication with scientific, technological and industrial stakeholders for the dissemination of information about Dr Inventor, including its motivation, objectives, approaches and results.
- To develop materials for disseminating the data-collecting approach of Dr Inventor to the general public exchange information with other initiatives and relevant projects.
- To actively promote the use of Dr Inventor within relevant professional groups, such as the computer graphics community.
- To allow for and promote the commercialisation of the Dr Inventor approach.

1.1 Summary of Novelty

During the last year of the Dr Inventor project, the key strategy was to intensify project results to a scientific community and researchers. Following are the highlights of last year dissemination activities presented in this document, including:

- New dissemination material *for SIGGRAPH & CASA 2016 Conference (Appendix 1)*
- Conference and workshops presentations
- Web presence
- Dr Inventor public website (main public source of information for the project)
- Online articles, news releases and awards
- Online social networking services
- Publications in conferences and journals proceedings
- Conference presentation and invited talk
- Video-clips of Dr Inventor activities
- Public project deliverables

In parallel with dissemination, exploitation results have played an important role in this project. Exploitation activities associate with the project outcomes with research and industrial users, and communicate the availability of the technology to potential users and to import the technology into suitable application domains.

2 Introduction

2.1 Purpose of this report

The motivation of this document is to provide a final overview of the project dissemination and exploitation results. This deliverable D9.4 “last year dissemination and exploitation report”, describes dissemination strategy and identifies channels of communication that have been used by the project consortium to achieve the goal of informing all relevant target groups about the project’s vision, its results and implications. The major aim was to ensure that appropriate methods are being used to effectively deliver key messages in an audience-specific way. Additionally, the document describes the exploitation activities for this project.

The dissemination and exploitation activities are designed

- to inform all internal and external stakeholders about the project results and the implications that these results might have for the research and industrial users.
- to communicate the availability of the technology to potential users and to import the technology into suitable application domains.

2.2 Relationship with other Deliverables

The WP9 ‘Dissemination and exploitation’ reports are delivered in three parts; D 9.2: “First year dissemination and exploitation report”, D 9.3: “Second year dissemination and exploitation report” and **D: 9.4 “Last year dissemination and exploitation report**”.

2.3 Structure of the document

The document is structured as follows. Chapter 3 presents last year dissemination activities. Chapter 4 addresses the exploitation aspects and Chapter 5 summarises the contributions.

3 Last year Dissemination Activities

This report highlights the dissemination activities that have been carried out from the months *(25 - 39)* of this project. During the final year of the Dr Inventor project, the key strategy was to create a wider impact of the project in the scientific community and researchers. The following are the dissemination activities that are supported by the entire consortium:

3.1 Dr Inventor System

Dr Inventor *(A personal research assistant)*, shown in Figure 3.1 is web-based system available online (http://drdev.ccgv.org.uk/Div/login)

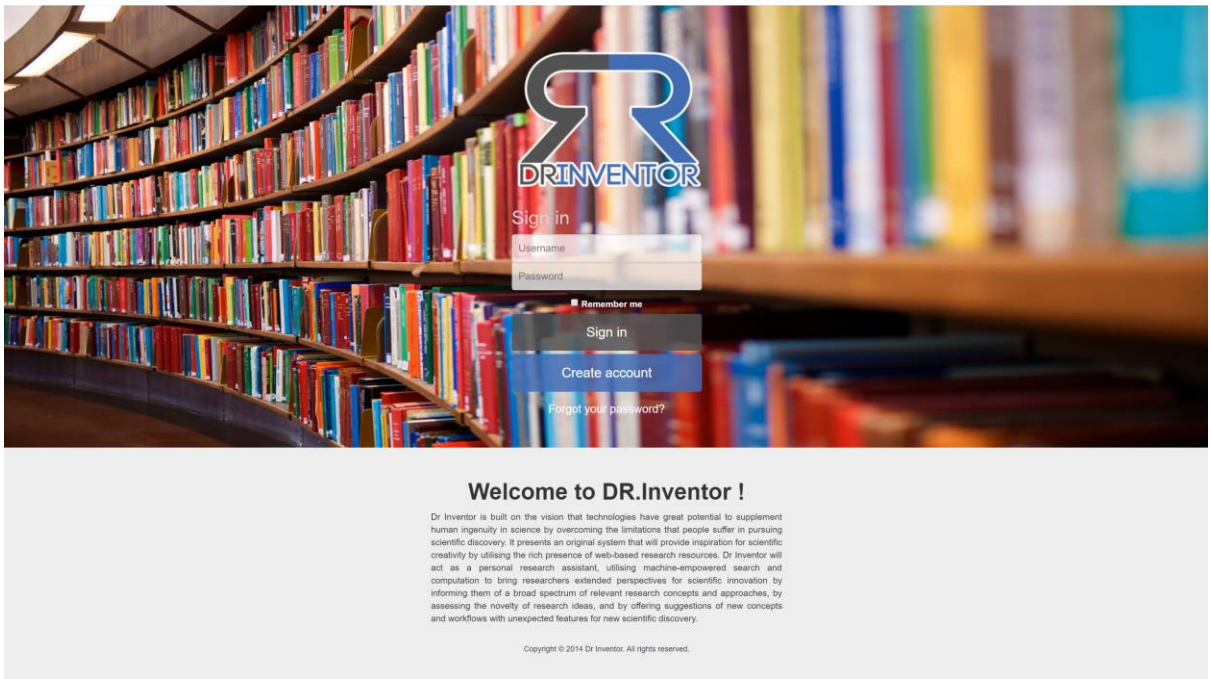


Figure 3.1 Dr Inventor web-based system

The google analytics statistics reports that the system has **982** users (21.4% are new visitors and 78.6% are returning visitors), **17,289** page views and average user session duration of **(8 min: 49 sec).** The statistics report covers the period from ***(1 July 2016 to 25 April 2017)***. A summary of the period is shown in Figure 3.2

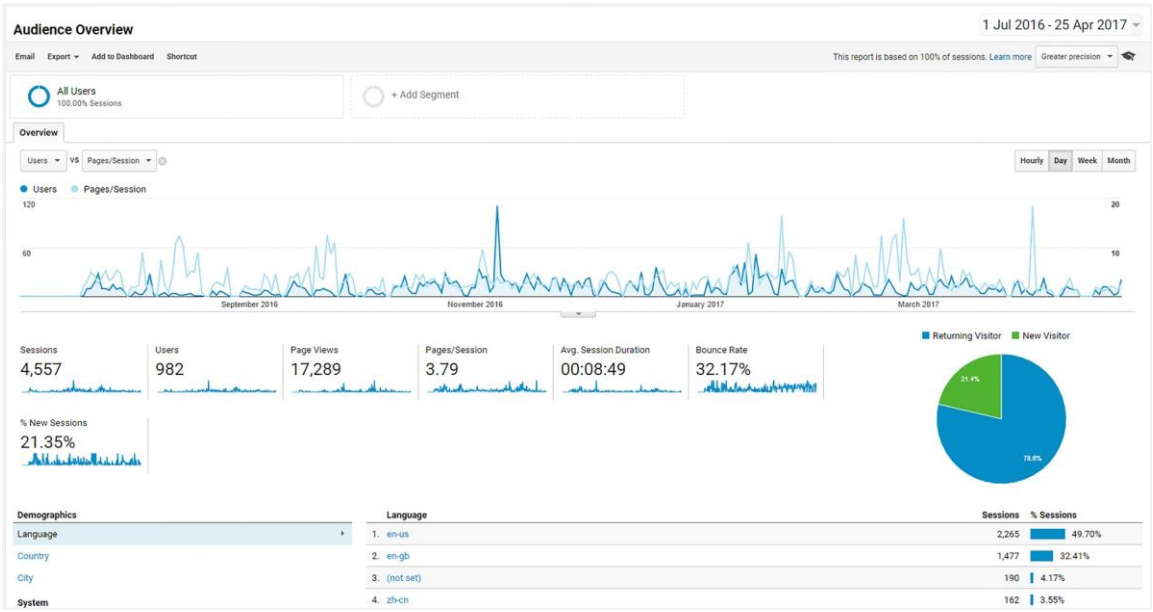


Figure 3.2 Overview of traffic (Dr Inventor System)

Dr Inventor has users across the world, Figure 3.3 shows the origin of users. The statistics shows that the number of Dr inventor users is growing in EU and the rest of the world.

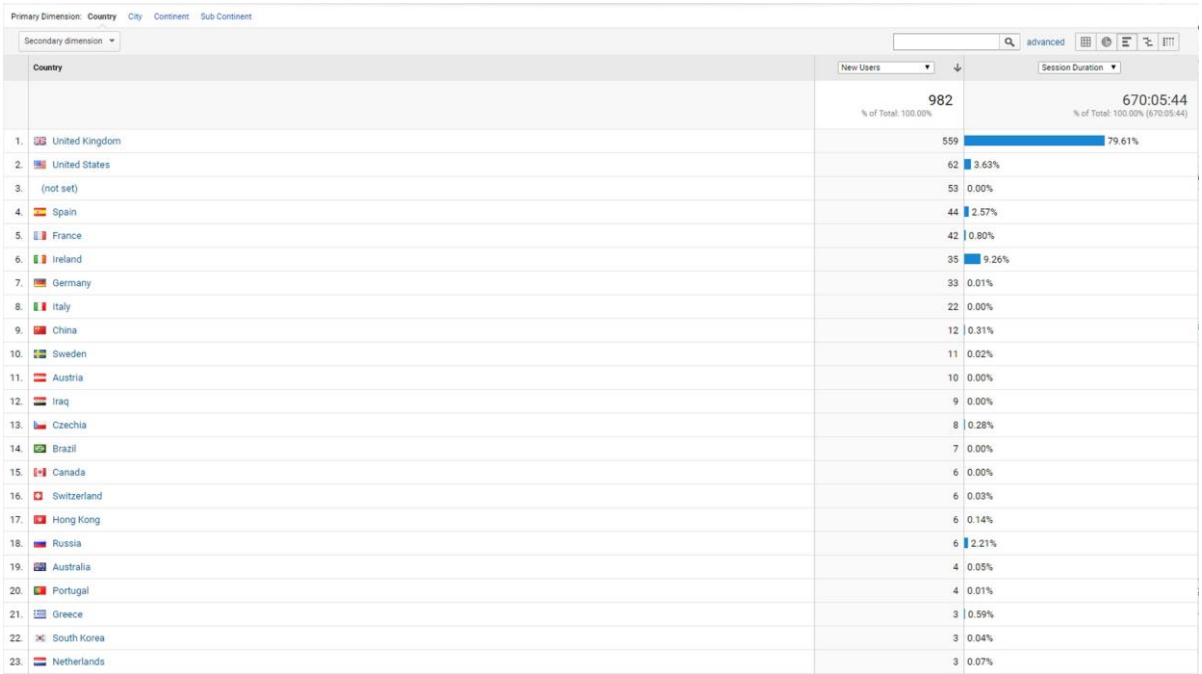


Figure 3.3 Origin of users

3.2 Online Articles and News

The following Dr Inventor project articles has been published:

Irish Tech News published an article on the Dr Inventor project

"Scientists based at Maynooth University are leading a European project on creative computing, which has created a novel research idea that is now being developed into a research publication. The new research idea was created by a computationally creative system called "Dr Inventor" and has been adopted and developed by researchers based at Bournemouth University. Dr Inventor took a number of connected ideas from one paper and applied those ideas to solve in a problem described in a second paper. Researchers in Bournemouth University found the resulting blend of problem and solution so interesting that they have explored the initial research hypothesis and are now developing the result into a published research paper." ***Article published by*** **'Irish Tech News'**

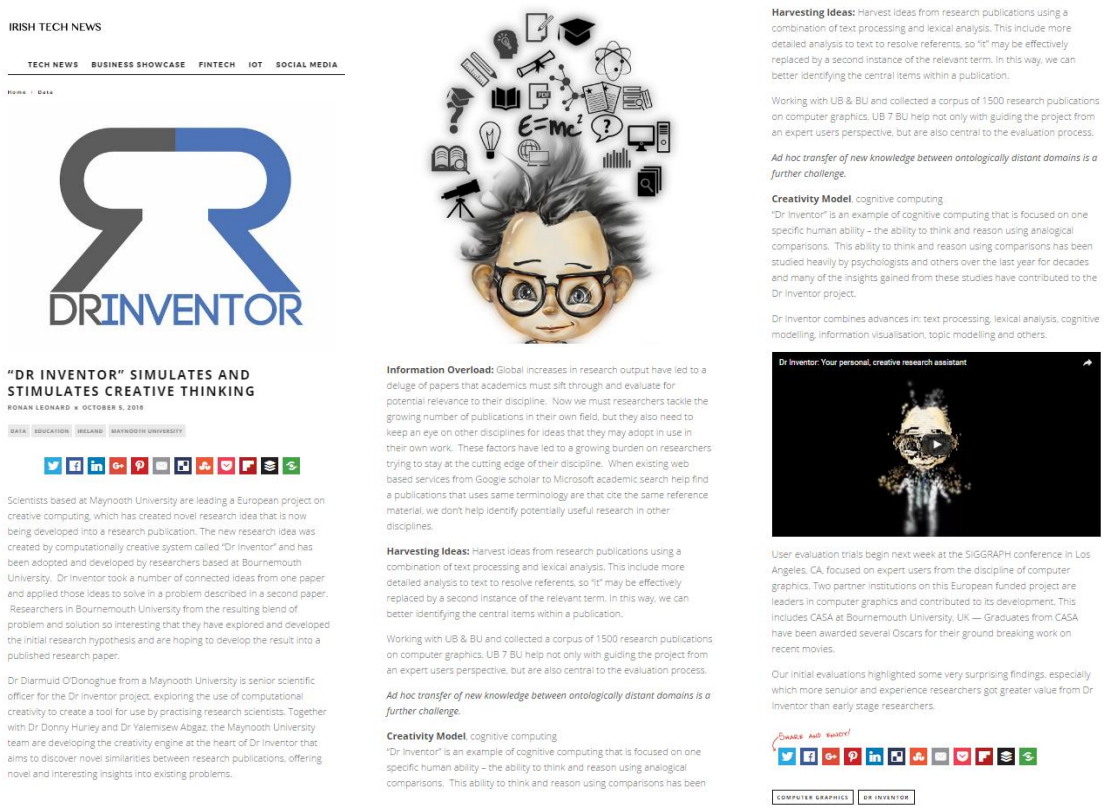


Figure 3.4 'Irish Tech News' published an article on the Dr Inventor project[3]

[3] http://irishtechnews.ie/dr-inventor-simulates-and-stimulates-creative-thinking/

Can computers support human beings in their creative processes?

"Scientific creativity and innovation represent the beating heart of European growth at a time of rapid technological change. Dr Inventor is built on the vision that technologies have great potential to supplement human ingenuity in science by overcoming the limitations that people suffer in pursuing scientific discovery." ***Article published on 'EU Commission portal'***

Figure 3.5 Article on EU Commission portal 'Can computers support human beings in their creative processes' [4]

[4] https://ec.europa.eu/digital-single-market/en/news/can-computers-support-human-beings-their-creative-processes

Research Article: Dr. Inventor, Promoting Scientific Creativity by Utilising Web-based Research Objects, FP7 (Science Impact)

A research article about Dr Inventor has been published on IngentaConnect *(the world's largest platform for scholarly information receiving over 1.5 million visits a month and used by over 30,000 institute libraries)*. The article is open access as well as subsequently seeded to Google Scholar, EBSCO Discovery, Primo Central, Worldcat and Summon. Each article published to IngentaConnect is supported by metadata that helps increase the articles visibility such as authors, affiliation, abstract, keywords and OrcidID. The benefit of this metadata is to make the article more visible in search results thus resulting in more downloads and shares for the article. All consortium members have contributed to this article.

Figure 3.6 Dr Inventor, Promoting Scientific Creativity by Utilising Web-based Research Objects, FP7 (Science Impact)[5]

[5] http://www.ingentaconnect.com/content/sil/impact/2017/00002017/00000002/art00015

Dr Inventor: Inspiring scientific creativity through technology innovation

An article presented that Dr Inventor project is a European Commission-funded research project that investigates whether technologies can help inspire scientific creativity for scientific researchers. It is built on the idea that technologies have the potential to supplement human ingenuity in the creative process in scientific exploration. The project, co-ordinated by Professor Feng Dong and Dr Diarmuid P O'Donoghue, marries scientific creativity and innovation to supplement human ingenuity in science.

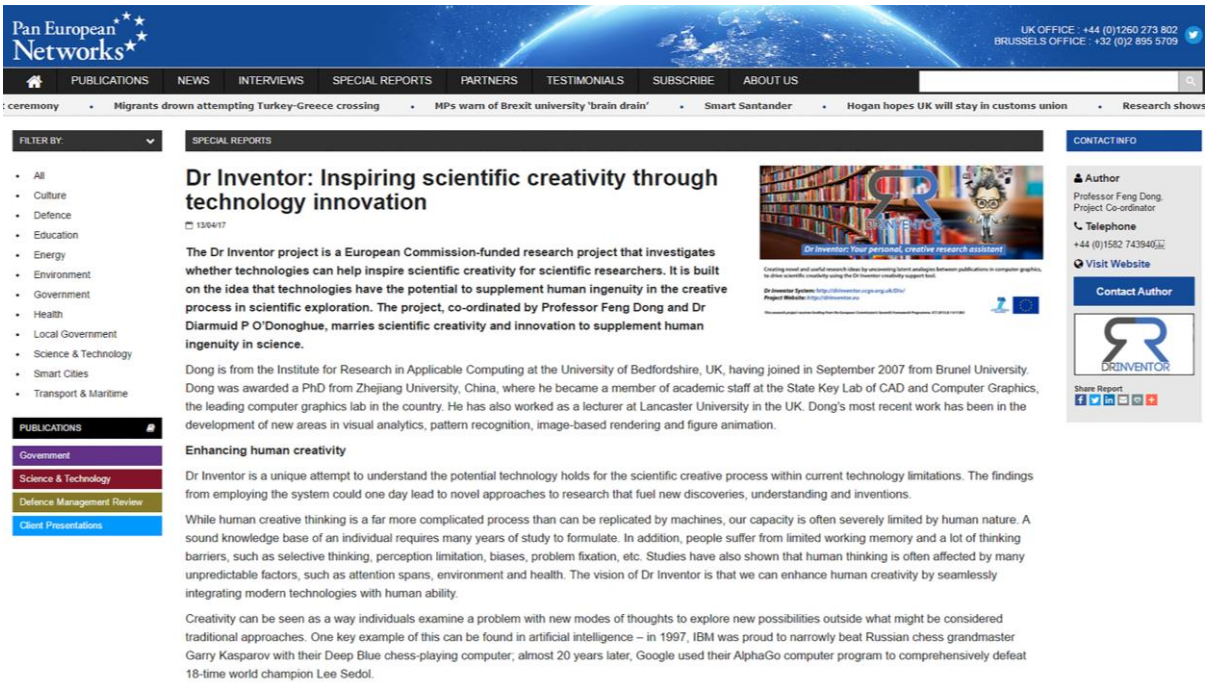


Figure 3.7 Dr Inventor: Inspiring scientific creativity through technology innovation[6]

[6] http://www.paneuropeannetworks.com/special-reports/dr-inventor-inspiring-scientific-creativity-through-technology-innovation/

3.3 Conference Presentations, Invited Talks and Tutorials

In addition to other dissemination channels, consortium members have taken part in project promotion activities by giving talks on selected topics related to the project.

- Prof Jian Jun Zhang from BU partner has given a keynote presentation on "Dr Inventor: Personal Research Assistant" to the audience of computer graphics researchers at Computer Graphics & Visual Computing (CGVC) 2016 Conference held at Bournemouth University, UK on Thursday, 15th September, 2016.

Figure 3.8 Prof Jian Jun Zhang's Keynote Talk at CGVC 2016 Conference[7]

- Prof Horacio Saggion gave a presentation at the Data-driven Knowledge Extraction Workshop[8] held at UPF on 28th and 29th of June 2016.
- Prof Horacio Saggion gave a presentation at the Royal Melbourne Institute of Technology (Australia) on 8th September 2016. Prof Horacio Saggion at the University of Melbourne (Australia) on 7th September 2016.

Figure 3.9 Prof Horacio Saggion's presentation at the Royal Melbourne Institute of Technology (Australia)

[7] http://www.eguk.org.uk/CGVC2016/programme.html

[8] https://www.upf.edu/web/mdm-dtic/maria-de-maeztu-annual-event

- Natural Language Processing for Intelligent Access to Scientific Information - tutorial given at the 26th International Conference on Computational Linguistics (COLING 2016) held in Osaka (Japan) on 11th December 2016 - Presenters: Francesco Ronzano and Horacio Saggion - In the tutorial the Dr, Inventor Project has been introduced and a demo of the Dr. Inventor Text Mining Framework has been presented.
- Machine Learning in Google Campus Madrid on 20th June 2016 (UPM). This meeting is oriented to share knowledge, in the form of use-cases, to discuss about the background and technologies used to solve a problem. The audience from both research and industrial profiles had attended this meeting.

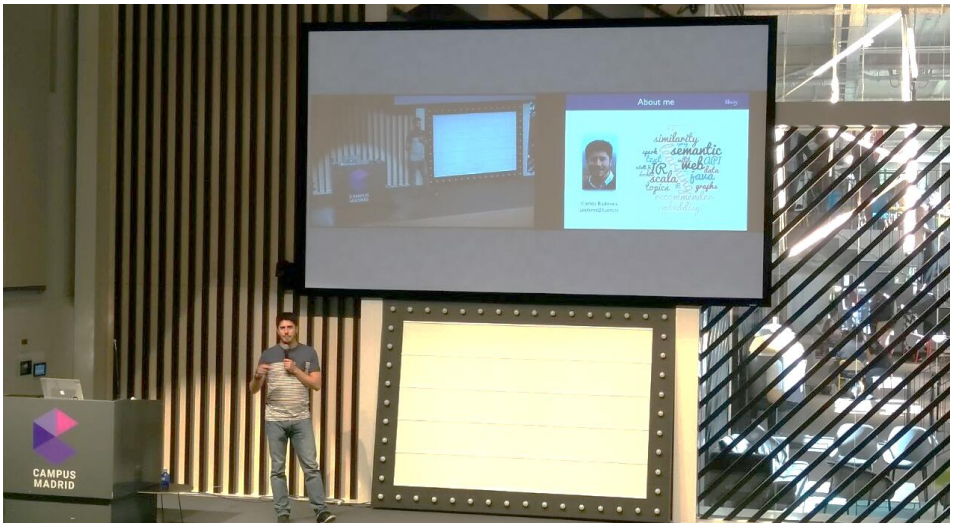


Figure 3.10 Machine Learning in Google at UPM Campus Madrid

3.4 Publication in Conferences and Journals

In the last year, the consortium has actively participated to publish many academic papers to create academic impact for the project. There are several conferences and journals that have been targeted by the consortium to publish project outcomes and its results. Table 3.1 shows a list of papers that have been contributed by consortium partners in the last year.

Table 3.1 List of publications achieved by partners in the last year of the project

Maynooth University, Ireland (NUIM) ***WP2*** *- Theoretical Modelling of Computational Scientific Creativity* ***WP8*** *- Evaluation of the Creative Performance of the System*			
Authors	Title	Appearance	Partners
Yalemisew Abgaz, Diarmuid P. O'Donoghue, Dmitry Smorodinnikov,	*Evaluation of Analogical Inferences Formed from Automatically Generated Representations of Scientific Publications*	*AICS, UCD, Ireland, September, 2016*	NUIM

Donny Hurley			
Yalemisew Abgaz, Diarmuid P. O'Donoghue, Donny Hurley, Horacio Saggion, Francesco Ronzano, Dmitry Smorodinnikov	*Embedding a Creativity Support Tool within Computer Graphics Research*	*ECAI - MRC workshop, August, 2016*	NUIM
Donny Hurley, Yalemisew Abgaz, Hager Ali, Diarmuid O'Donoghue	*Expert and Corpus-Based Evaluation of a 3-Space Model of Conceptual Blending*	*ECAI - EGPAI workshop, August, 2016*	NUIM
Donny Hurley, Diarmuid P. O'Donoghue, Yalemisew Abgaz	*Generating Lexico-Semantic Graphs for Novel Analogies between Computer Graphics Publications using Dr Inventor*	*6th UK Cognitive Linguistics Conference, Tuesday July 19 - Friday July 22, 2016*	NUIM
Yalemisew Abgaz, Diarmuid P. O'Donoghue, Donny Hurley, Ehtzaz Chaudhry, Jian Jun Zhang	*Characteristics of Pro-c Analogies and Blends between Research Publications*	*International Conference on Computational Creativity, ICCC 2017*	NUIM / BU

Pompeu Fabra University, Spain (UPF) ***WP4*** **-** *Information Extraction & Text*			
Authors	Title	Appearance	Partners
Fisas, Beatriz, Francesco Ronzano, and Horacio Saggion	*A Multi-Layered Annotated Corpus of Scientific Papers.*	*Language Resources and Evaluation Conference 2016*	UPF
Ronzano, Francesco, and Horacio Saggion	*Knowledge Extraction and Modeling from Scientific Publications*	*Enhancing Scholarly Data Workshop - SAVE-SD - in conjunction with World Wide Web Conference 2016*	UPF

Ronzano, Francesco, Ana Freire, Diego Saez-Trumper, and Horacio Saggion	*Making Sense of Massive Amounts of Scientific Publications*	*Proceedings of the Joint Workshop on Bibliometric-enhanced Information Retrieval and Natural Language Processing for Digital Libraries (BIRNDL) co-located with the Joint Conference on Digital Libraries 2016*	UPF
Saggion, Horacio, Ahmed AbuRa'Ed, and Francesco Ronzano	*Trainable Citation-enhanced Summarization of Scientific Articles*	*Proceedings of the Joint Workshop on Bibliometric-enhanced Information Retrieval and Natural Language Processing for Digital Libraries (BIRNDL) co-located with the Joint Conference on Digital Libraries 2016*	UPF
Ronzano, Francesco, and Horacio Saggion	*An Empirical Assessment of Citation Information in Scientific Summarization*	*International Conference on Applications of Natural Language to Information Systems. Springer International Publishing, 2016*	UPF
Espinosa-Anke, Luis, Saggion, Horacio, Ronzano, Francesco, & Navigli, Roberto	*Extasem! extending, taxonomizing and semantifying domain terminologies*	*In Proceedings of the 30th Conference on Artificial Intelligence (AAAI'16)*	UPF

Espinosa-Anke, Luis, Camacho-Collados, Jose, Bovi, Claudio, & Saggion, Horacio	*Supervised distributional hypernym discovery via domain adaptation*	*In Proceedings of EMNLP 2016*	UPF
Ronzano, Francesco Abura'ed, Ahmed, Espinosa-Anke, Luis, & Saggion Horacio	*TALN at SemEval-2016 Task 11: Modelling Complex Words by Contextual, Lexical and Semantic Features*	*Proceedings of SemEval 2016, pp. 1011-1016*	UPF
Espinosa-Anke, Luis, Saggion, Horacio, & Ronzano, Francesco	*Task 14: Semantic Taxonomy Enrichment Via Sense-Based Embeddings*	*Proceedings of SemEval 2016, pp. 1332-1336*	UPF
Codina-Filbà, Joan, Bouayad-Agha, Nadjet, Burga, Alicia, Casamayor, Gerard, Mille, Simon, Müllerb, Andreas, Saggion, Horacio & Wanner, Leo	*Using genre-specific features for patent summaries*	*Information Processing & Management, 53(1), pp. 151-74*	UPF

Universidad Politécnica de Madrid, Spain (UPM) ***WP 5*** *- Semantic technologies for exploring research objects*			
Authors	Title	Appearance	Partners
José Luis Redondo-García, David Chaves Fraga, Carlos Badenes Olmedo and Oscar Corcho	*Towards an Integrated Approach for Ontology Learning Evaluation*	*(submitted to ISWC2017)*	UPM
Submission in progress	*Technical features and Machine Learning along with NLP techniques used to build the repository*		UPM
Submission in progress	*Evaluation of the platform from the point of view of the textual semantic similarity results*		UPM

University of Bedfordshire, UK, (BED) ***WP 5 -*** *Semantic technologies for exploring research objects* ***WP 6 -*** *Visual analytics for interactively exploring scientific creativity* ***WP7 -*** *Integration into a web-based system for exploring scientific creativity*			
Authors	Title	Appearance	Partners
Y. Zhao, H. Wei, S. Wu, Z. Deng, F. Parvinzamir, S. Wilson, F. Dong, G. Clapworthy , E. Liu	*Topic-enabled Visual Citation Tracing with Improved Term Weight to Facilitate Scientific Literature Retrieval*	*Communications in Computer and Information Science, CCIS, Springer*	BED
Y. Zhao, F. Parvinzamir, S. Wilson, H. Wei, Z. Deng, N. Portokallidis, A. Third, G. Drosatos, E. Liu, F. Dong, V. Marozas, A. Lukosevicius, E.Kaldoudi, and G. Clapworthy	*Integrated Visualisation of Wearable Sensor Data and Risk Models for Individualised Health Monitoring and Risk Assessment to Promote Patient*	*Empowerment, Journal of Visualisation (accepted for publication*	BED
H. Wei, Y. Zhao, S. Wu, Z. Deng, F. Parvinzamir, F. Dong, E. Liu, G. Clapworthy	*Management of Scientific Documents and Visualization of Citation Relationships using Weighted Key Scientific Terms.*	*In the Proceedings of the 5th International Conference on Data Management Technologies and Applications DATA 2016. pp. 135-143, Lisbon, Portugal, 24-26 July 2016*	BED
H. Wei, S. Wu, Y. Zhao, Z. Deng, N. Ersotelos, F. Parvinzamir, B. Liu, E. Liu, F. Dong	*Data Mining, Management and Visualization in Large Scientific Corpuses*	*Edutainment 2016:371-379, Hangzhou, China, April 14-16, 2016*	BED

Bournemouth University, UK (BU) ***WP 8 -*** *Evaluation of the creative performance of the system*			
Authors	Title	Appearance	Partners
Submission in progress	*Modelling and Simulation of Lily flowers using ODE Sweeping Surfaces*		BU/ NUIM/ BED

3.5 Dr Inventor Project Website

The project's public website (http://drinventor.eu) is the main dissemination channel which has helped the project to share the vision, objectives, approaches, public deliverables, publications and results to a wide audience. The project website has been regularly updated throughout the project.

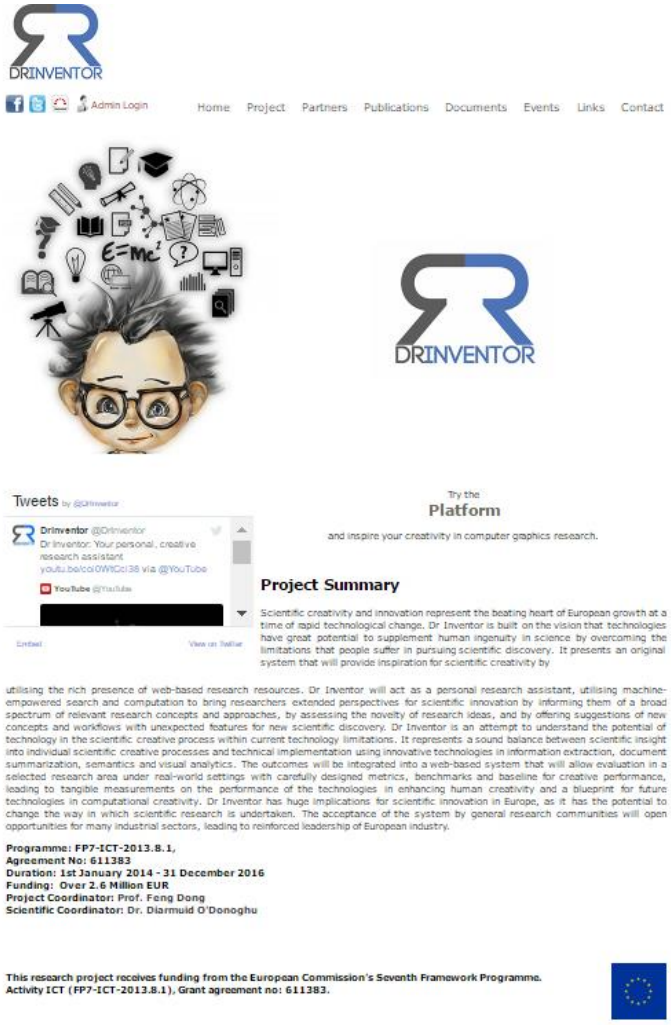


Figure 3.11 Dr Inventor Project Website

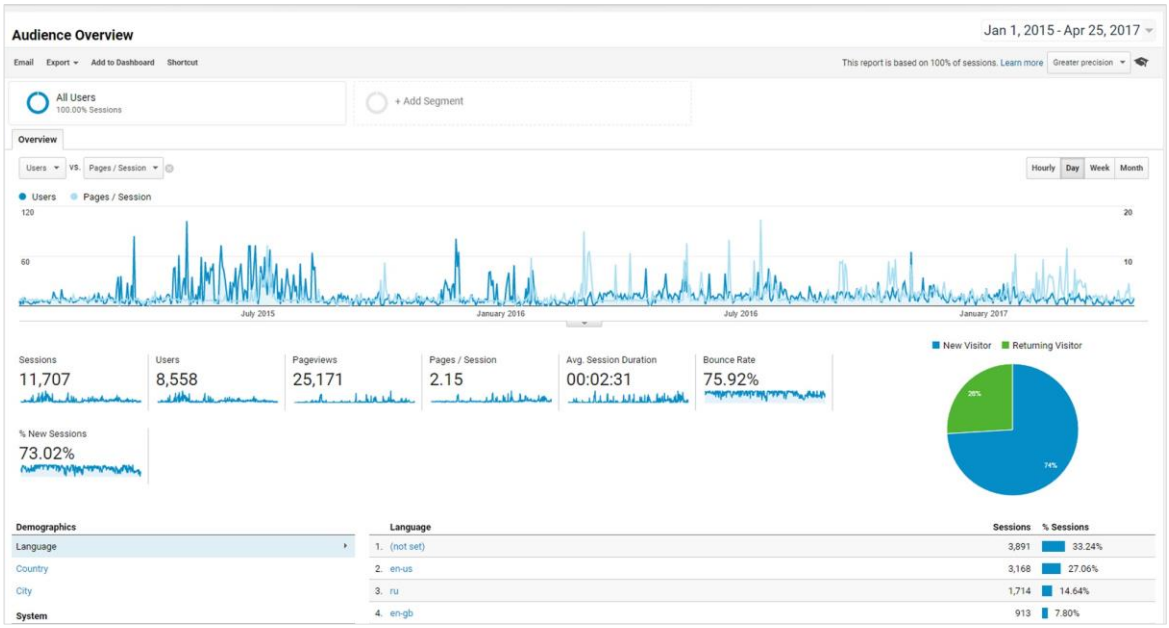


Figure 3.12 Overview of traffic (Dr Inventor Project Website 1 Jan2015 – 25 April 2017)

The google analytics statistics reports that the website has **8 ,558** users (26% are new visitors and 74% are returning visitors), **25,171** page views and average user session duration of **(2 min: 31 sec).** The statistics report covers the period from ***(1 Jan 2015 to 25 April 2017)***. A summary of the period is captured in Figure 3.12 and yearly stats is list below in table 3.1.

Table 3.1 Yearly stats of audiences (Dr Inventor Project Website 1 Jan2015 – 25 April 2017)

Yearly Stats	Users	No. of page viewed
1 Jan 2015- 31 Dec 2015	4,467	8,266
1 Jan 2016- 31 Dec 2016	3,439	13,289
1 Jan 2017- 31 April 2017	652	3,616

Dr Inventor website has users from across the world, Figure 3.13 show the origin of users around the world.

Country	Sessions	Sessions	Contribution to total: Sessions
	11,707 % of Total: 100.00% (11,707)	11,707 % of Total: 100.00% (11,707)	
1. United Kingdom	2,309	19.72%	
2. Russia	2,150	18.37%	
3. United States	1,985	16.96%	
4. (not set)	1,086	9.28%	
5. Spain	552	4.72%	
6. Ireland	498	4.25%	
7. Brazil	298	2.55%	
8. China	279	2.38%	
9. Germany	242	2.07%	
10. Japan	190	1.62%	
11. Italy	160	1.37%	
12. Kyrgyzstan	156	1.33%	
13. France	142	1.21%	
14. India	117	1.00%	
15. Netherlands	104	0.89%	
16. South Korea	94	0.80%	
17. Canada	83	0.71%	
18. Greece	83	0.71%	
19. Switzerland	69	0.59%	
20. Turkey	67	0.57%	
21. Belgium	64	0.55%	
22. Czechia	62	0.53%	
23. Australia	57	0.49%	
24. Ukraine	52	0.44%	

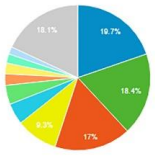


Figure 3.13 Origin of web site visitors. (Dr Inventor Project Website 1 Jan2015 – 25 April 2017)

3.6 Dr Inventor Web Presence

Dr Inventor has appeared in the following web pages.

BU's Dr Inventor team to present their research at SIGGRAPH [9]
Dr Inventor Text Mining Framework[10]
Dr Inventor Multi-layer Scientific Corpus [11]
Dr Inventor Text Mining Framework [12]
Corpus of 40 scientific papers manually annotated by multiple scientific discourse facets[13]
Dr Inventor Simulates and Stimulates Creative Thinking[14]
Dr Inventor project public release at SIGGRAPH 2016[15]
Dr Inventor Repository[16]
Dr Inventor CASA Workshop[17]
Dr Inventor featured on SIGGRAPH 2016 website as Exhibitor sessions[18]
How can Natural Language Processing improve access to scientific literature? [19]
Dr Inventor Text Mining Framework[20]

[9] http://blogs.bournemouth.ac.uk/research/2016/07/17/bus-dr-inventor-team-to-present-their-research-at-siggraph/#sthash.wzrergrp.dpuf

[10] https://portal.upf.edu/web/mdm-dtic/-/dr-inventor-text-mining-framework?inheritRedirect=true&redirect=%2Fweb%2Fmdm-dtic%2Fsoftware#.WA8_U-grJaR

[11] https://portal.upf.edu/web/mdm-dtic/-/-text-dr-inventor-multi-layer-scientific-corpus?inheritRedirect=true&redirect=%2Fweb%2Fmdm-dtic%2Fdatasets#.WA9AG-grJaQ

[12] http://backingdata.org/dri/library/

[13] http://sempub.taln.upf.edu/dricorpus

[14] https://www.maynoothuniversity.ie/news-events/dr-inventor-simulates-and-stimulates-creative-thinking

[15] https://www.maynoothuniversity.ie/computer-science/news/dr-inventor-project-public-release-siggraph-2016

[16] http://drinventor.dia.fi.upm.es/

[17] http://casa2016.miralab.ch/Dr%20Inventor.html

[18] http://s2016.siggraph.org/exhibitor-sessions-1

[19] https://www.upf.edu/web/mdm-dtic/blog/-/blogs/how-can-natural-language-processing-improve-access-to-scientific-literature-tutorial-at-coling-2016?_33_redirect=%2Fweb%2Fmdm-dtic%2F-%2Fdr-inventor-text-mining-framework%3FinheritRedirect%3Dtrue%26redirect%3D%252Fweb%252Fmdm-dtic%252Fsoftware#.WMpiicCLRaR

[20] http://driframework.readthedocs.io/en/latest/

3.7 Social Media

Social media is a key dissemination channel to increase public awareness. In the last year of Dr Inventor project, the 'likes' and friends of Dr Inventor Facebook page have grown significantly. Figure 3.11 highlights (450) users, (203) posts and (91) following of Dr Inventor Facebook page. Dr Inventor Facebook page stats are described in the Figure 3.14.

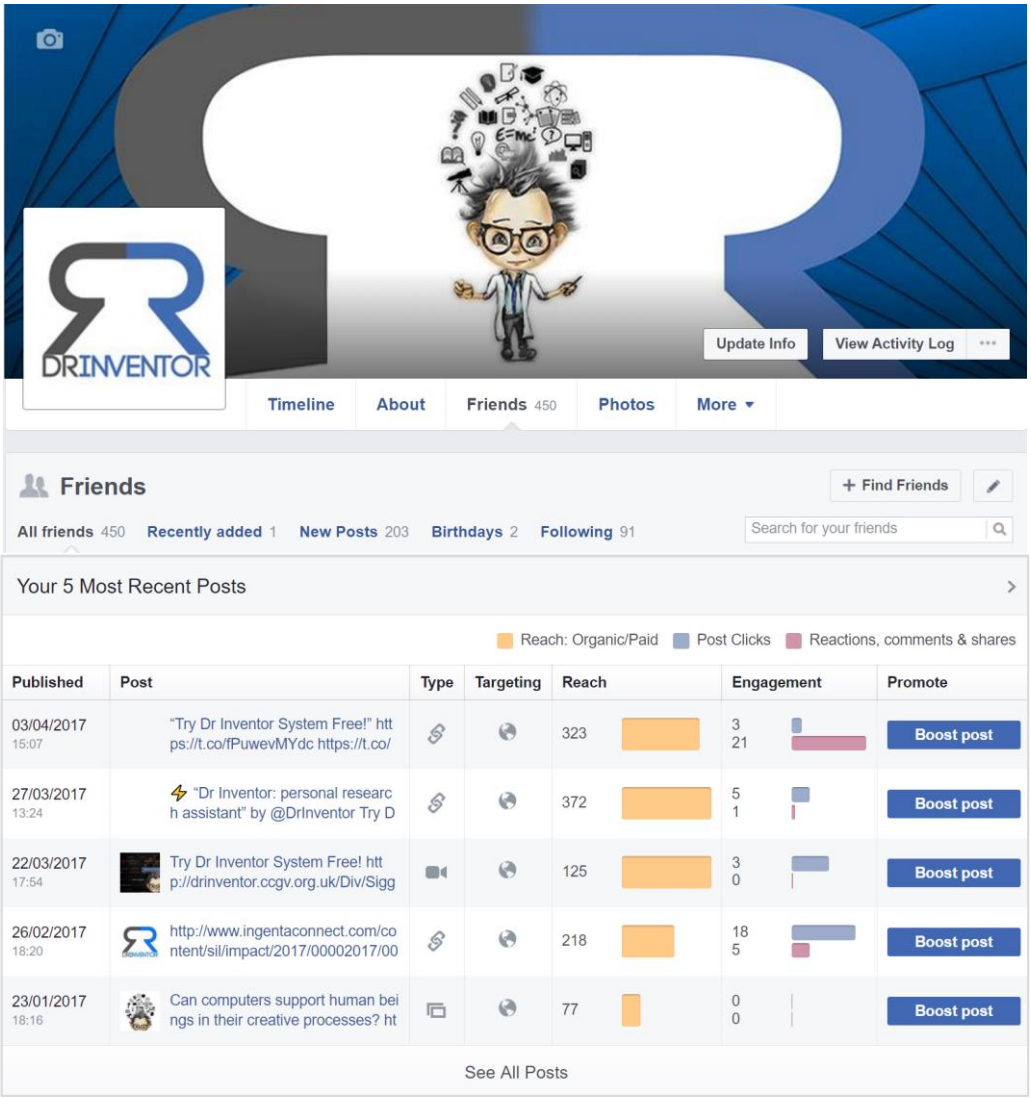


Figure 3.14 Dr Inventor Facebook page

Although the Dr Inventor Facebook page has only attracted just above 91 "likes" (followers) worldwide, the resulting in high reach out on various posts.

Figure 3.15 Dr Inventor Twitter page

Dr Inventor twitter account has played an important part in sharing Dr Inventor project to new and a wider audience. Dr Inventor Twitter account (shown in Figure 3.15) has been used to contact SIGGRAPH authors. Figure 3.16 highlights (59) tweets, (1,216) following, (127) followers and (51) likes of Dr Inventor twitter page. Dr Inventor Twitter page stats are described in the Figure 3.16.

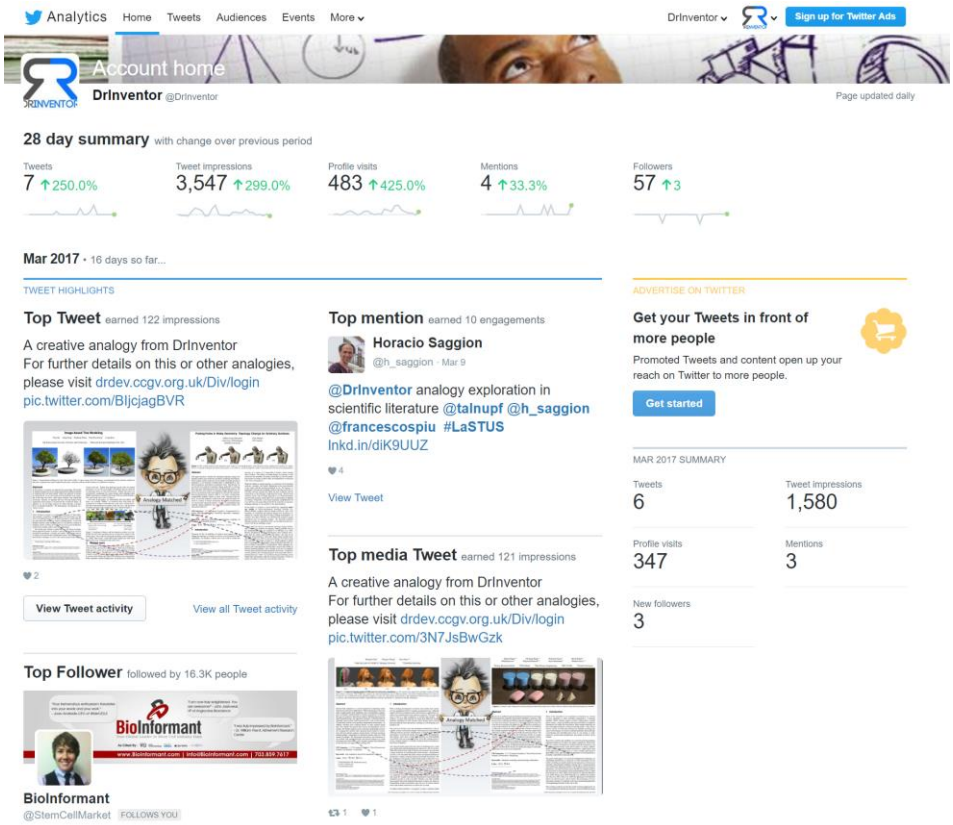


Figure 3.16 Dr Inventor Twitter page stats

3.8 Dr Inventor Workshop Organization and Project Exhibition

WP9 task 9.3 "Workshop" (Task Leader: BU), has organised Dr Inventor workshops at CASA and SIGGRAPH 2016 conferences. These activities have enabled us to showcase Dr Inventor system and offer early versions of the software to selected scientists and researchers.

3.7.1 CASA 2016 Conference

CASA 2016[21] conference, was held at the University of Geneva, Switzerland in Biotech Campus on May 23-25th, 2016. CASA is a reasonably large European conference that addresses topics in computer graphics. CASA 2016 conference was organised by MIRALab, the University of Geneva in cooperation with ACM-SIGGRAPH and The Eurographics Association and supported by the Computer Graphics Society (CGS). More than 120 graphics researchers have attended CASA 2016 Conference.

The main contributions were:

- Prior to CASA 2016 conference, the consortium has built a corpus of CASA 2016 accepted papers for Dr Inventor workshop, giving authors an opportunity to view creative analogies discovered for their accepted paper.
- BU has obtained a mailing list of all CASA 2016 authors.
- An email invite was sent to CASA 2016 authors. *(the authors were invited to attend Dr Inventor workshop and discover creative analogies from their own paper)*

Figure 3.17 Diarmuid presentation on 'Computational Creativity and Analogies' at CASA Workshop

Dr Inventor Workshop[22] at CASA 2016 conference was held on May 23rd, led by program Chair Diarmuid O'Donoghue, partner from (NUIM). With over 20 participants have attended the Dr Inventor Workshop.

The first session of Dr Inventor workshop included a presentation on 'Computational Creativity and Analogies' from Diarmuid, this was followed by presentations on 'Creativity and Computer Graphic' by Prof Jian J Zhang. In addition, Dr Chaudhry from BU partner gave a presentation on his work on

[21] http://casa2016.miralab.ch/

[22] http://casa2016.miralab.ch/Dr%20Inventor.html

'ODE-Based approach to represent natural flower shape, flower blossom and decay process'. Dr Nikolaos Ersotelos from BED partner has presented Dr Inventor system during Tutorial sessions.

Figure 3.18 Prof Jian Jun Zhang presentation 'Creativity and computer graphics' at CASA Workshop

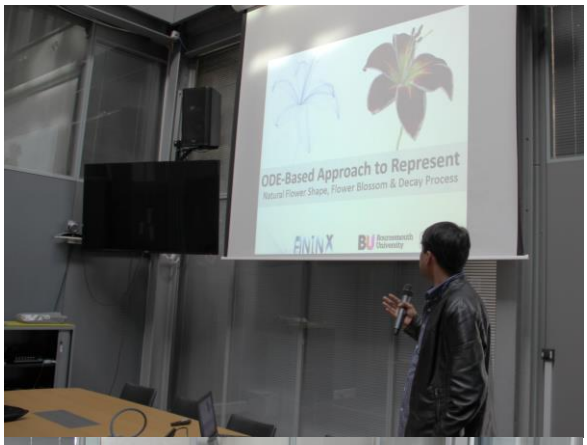


Figure 3.19 Dr Chaudhry presentation 'ODE-Based approach to represent natural flower shape, flower blossom and decay process' at CASA Workshop

Figure 3.20 Dr Inventor workshop and poster session

In the second session of Dr Inventor workshop, the audience was given an opportunity to try the Dr Inventor system and record feedbacks. In addition to Dr Inventor workshop, Dr Inventor system was also presented during the poster session of CASA 2016 Conference and Dr Inventor flyers were distributed. 18 attendees have registered to the Dr Inventor system during CASA 2016 conference.

3.7.2 SIGGRAPH 2016 Conference

SIGGRAPH conference is considered as the most prestigious forum for the publication of computer graphics research and technical progress from the research community and the leading movie studios around the world. SIGGRAPH 2016 conference was held in Anaheim, California, USA[23], more than 4000 attendees and 153 exhibitors have taken part. The Exhibition has attracted the leaders in the industry by consistently showcasing the latest innovations in computer graphics. Due to the great importance of this conference, BU has organised three main events of Dr Inventor at SIGGRAPH 2016 conference. Partners from BU, BED and NUIM were involved in this dissemination activity.

The main contributions were:

- Prior to SIGGRAPH 2016 conference, the consortium has built a corpus of SIGGRAPH 2016 accepted papers for Dr Inventor workshop, giving SIGGRAPH 2016 authors an opportunity to view creative analogies discovered for their accepted papers.
- NUIM and BU have obtained a mailing list of all SIGGRAPH 2016 authors.
- An email invite was send to SIGGRAPH 2016 authors. *(authors were invited to attend Dr Inventor 1-hour Tech-Talk and the exhibition booth)*
- One of the primary focus of the user evaluation plan for SIGGRAPH 2016 Conference is "creative analogies evaluation" based on the quality of analogies that have been discovered from SIGGRAPH 2016 accepted papers.
- During the Dr Inventor exhibition, 170 attendees' badges were scanned. These attendees include SIGGRAPH 2016 authors, researchers and SIGGRAPH reviewers.
- More than 50 attendees have registered to the Dr Inventor system during SIGGRAPH 2016 conference.
- Dissemination of the project vision and results during SIGGRAPH 2016 conference.
- Distributed Dr Inventor banners, flyers, a brochure, a project demo during SIGGRAPH 2016 conference.
- New dissemination materials for SIGGRAPH 2016 (Appendix 1)

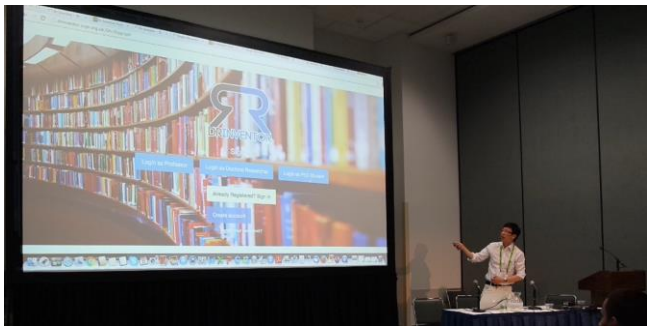
[23] https://en.wikipedia.org/wiki/SIGGRAPH

DR INVENTOR MAIN EVENTS AT SIGGRAPH 2016 CONFERENCE

Dr Inventor 90 Sec Fast Forward session took place on 26th July 2016. Diarmuid O'Donoghue gave a short presentation on Dr Inventor project, which was followed by the Dr Inventor project demo. It is estimated that more than 300 people have attended this session.

Figure 3.21 Dr Inventor Tech Talk Session

Dr Inventor 1-hour Tech Talk session: Dr Inventor 1-hour Tech Talk took place on 27th July 2016. During this session, Prof Feng Dong introduced the project to the audience, Diarmuid O'Donoghue gave a presentation on 'Computational Creativity and Analogies' and Prof Jian Jun Zhang gave a presentation on 'Creativity and computer graphics'.



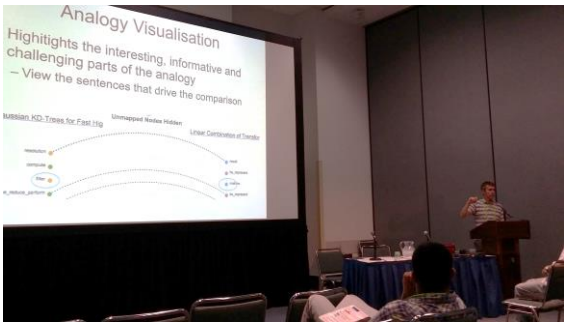
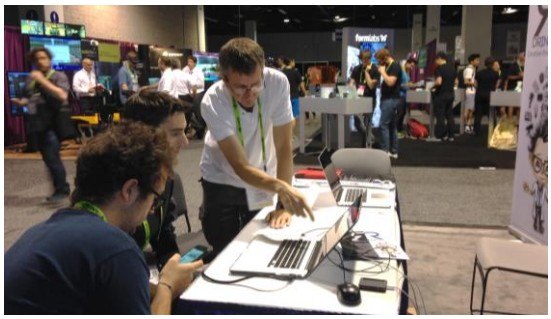


Figure 3.22 Dr Inventor 1 hour Tech Talk

Dr Inventor 3 Days Project Exhibition[24]: a 200-square-foot booth was booked by BU for Dr Inventor project exhibition, which took place from 26-28th July 2016 at Anaheim Convention Center, California, USA. The exhibition booth occupied a 10x20 (square feet area) at a corner location.



[24] https://iebms.heiexpo.com/iebms/oep/oep_p1_exhibitors.aspx?sessionid=fb9ej4ejoejpfc5fhoff0

Figure 3.23 Dr Inventor Booth

Figure 3.24 Expo smart registration control systems used at exhibition

During the Dr inventor exhibition, more than 170 attendees' badges were scanned. These attendees include SIGGRAPH 2016 authors, researchers and SIGGRAPH reviewers. The SIGGRAPH 2016 conference has provided us with a much larger and more varied body of potential users and encourages an increased data collection activity. We hope that many of these will not be just one time users, but will be returning users who give continuing and long-term feedbacks about Dr Inventor and make use of the system for their research activities.

3.9 Dr Inventor Promotion Videos & Activities

Dr Inventor YouTube channel[25] has been launched to promote the project vision to the public. Project video, demo presentations and demonstrations of various techniques have been available to the public.

Dr Inventor 40 *sec* Introductory Video[26]
382 views

Dr Inventor 2 *min* Introductory Video[27]
146 views

Dr Inventor Project Demo Video[28]
107 views

Dr Inventor Introduction Video[29]
64 views

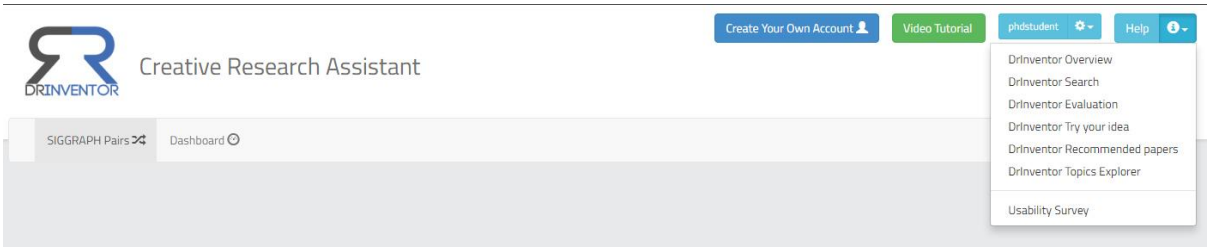


Figure 3.25 Dr Inventor system Help menu

Various features of Dr Inventor project (System search, try your idea, recommended papers, topic explorer and evaluation) have been captured and uploaded on Dr Inventor YouTube channel. These videos are also linked from the 'Dr Inventor system' help menu (as shown in Figure 3.25) for users to get an overview of the system.

[25] https://www.youtube.com/channel/UCW7PHW1kc93I5cueDnbA-WA
[26] https://youtu.be/UqJ_H8L1uGI
[27] https://youtu.be/coi0WtCci38
[28] https://youtu.be/d8hjzDoKKnA
[29] https://youtu.be/0EAZaI7-rKM

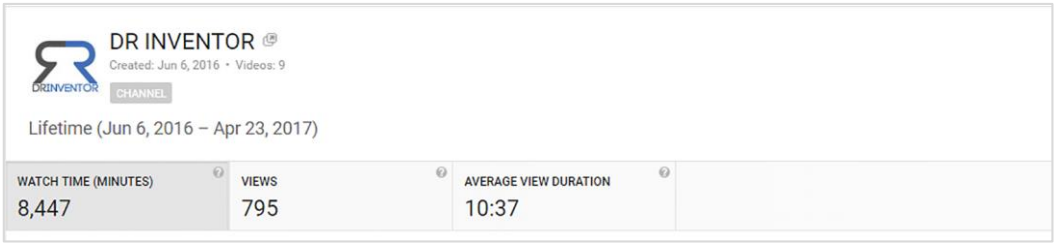


Figure 3.26 Dr Inventor YouTube channel stats

Dr Inventor YouTube channel stats are captured in Figure 3.26 from *(6 June 2016 to 23 April 2017).* The statistics reports 795 views, across the world mainly from UK, Ireland, Spain, USA and France. Total watch time is 8,447 (mins) for 9 Videos.

3.10 Dr Inventor system evaluation Domain Experts (Internal users)

The primarily focus of Dr Inventor system evaluation was to assess the outputs generated from the analogy model by domain experts (computer graphics). For the system evaluation, we have involved computer graphics domain experts from BU and BED.

- 10 Master students from BU
- 60 Undergraduates students from BU *(Dr Inventor System Usability Test)* captured in Figure 3.27
- A group of 12 academics (Professors, Associate Professors, Senior Lectures, Lectures and PhD Research students) from BU *(Completed Topic-base Case study)*
- A group of 4 academics (Professors, Senior Lectures and Lectures) from BED *(Completed Topic-base Case study)*

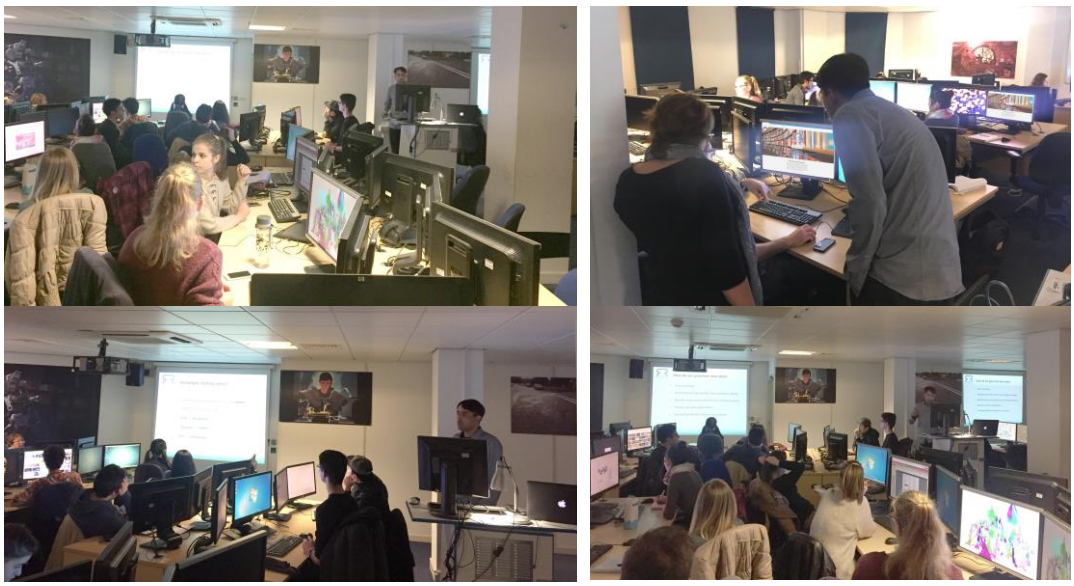


Figure 3.27 Undergraduates students taken part in the Dr Inventor evaluation

3.11 Dr Inventor system evaluation Domain Experts (External users)

SIGGRAPH Author's Feedback on the Analogies Identified by the Graphics Experts

As a part of Dr Invertor system evaluation, we have been contacting SIGGRAPH authors for their feedbacks on (**204**) creative analogies[30] that are identified by Dr Inventor system. So far, we have received **34** responses on creative analogies. ***(Currently, we are receiving feedbacks from SIGGRAPH authors. The final feedback result will be presented at the review meeting in May).***

Table 3.2 List of external users

No	External users	No of contacts
1	CASA 2016 Authors	170
2	SIGGRAPH 2016 Authors	900
3	Dr Inventor SIGGRAPH 2016 Booth and tech-talk Attendees	170
4	Science Impact subscribers	500
5	Dr Inventor system existing users	250+

3.12 Public Project Deliverables

These deliverables are used to disseminate project information to all interested audiences. All project deliverables, apart from those corresponding to the project management work package, are open to public and will be freely available for downloading from the project website. The large number of public deliverables serve the project's dissemination plan in an important way by offering detailed information to all interested audiences.

Currently, the following deliverables are published on Dr Inventor website which are freely available to the public.

- D2.1 User requirement and use case report
- D2.2 Report for ROS
- D2.3 Initial version of report for computational scientific creativity
- D2.4 Final version of report for computational scientific creativity
- D5.2 Initial version of the scientific ontologies
- D5.3 Final version of the scientific ontologies
- D5.4 Repository of indexed ROSs
- D7.1 Initial version of SDK toolkit for exploring scientific creativity
- D7.2 Initial version of Web-based system for exploring scientific creativity
- D7.3 Final version of SDK toolkit for exploring scientific creativity
- D7.4 Final version of Web-based system for exploring scientific creativity

[30] https://docs.google.com/spreadsheets/d/1PlQwshePdy94OjFsVELOWvDaF9qKpVkWuuCdnMeWI5E/edit#gid=0

- D8.1 Initial version of evaluation methodology report
- D8.2 Initial version of Benchmark datasets
- D8.3 Final version of Evaluation methodology report
- D8.4 Final version of benchmark datasets
- D8.5 Initial version of evaluation report
- D8.6 Final version of evaluation report*
- D9.2 First year dissemination and exploitation report
- D9.3 Second year dissemination and exploitation report
- D9.4 Last year dissemination and exploitation report

** Deliverable (8.6 Final version of evaluation report) is public report which will made available as public after the acceptance of their paper.*

4 Exploitation

This section describes the exploitation plan and projects based on Dr Inventor Technologies. We explain how Dr Inventor partners envision the future of this project, how we wish to keep it online and updated, what future we imagine in terms of business exploitation, and which project have been already launched or what plan to be launched in the coming weeks and months.

4.1 The Future of Dr Inventor

Here we describe how we plan the future of Dr Inventor developments.

Technical Part

Dr Inventor universities partners plan to keep Dr Inventor SaaS application online for two years. Web services will be hosted by their respective developer's entities.

NUIM: One server is available hosting the online system. All services will be hosted on the following system (http://dodsrv.cs.nuim.ie/drinventor) captured in Figure 4.1. Maintenance will be under the control of the Department of Computer Science at Maynooth University. This will be subject to the policies of the Computer Center of Maynooth University. This server will also be maintained for 2 years – or as long at the relevant hardware/server lasts.

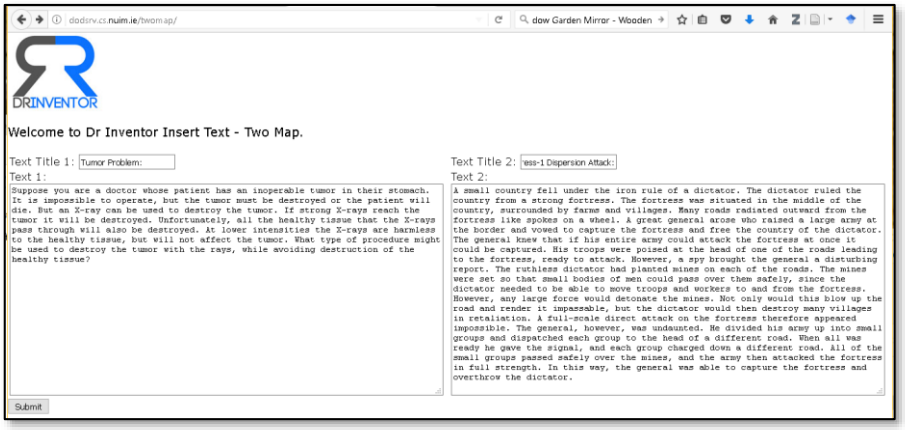


Figure 4.1 system (http://dodsrv.cs.nuim.ie/drinventor)

Additionally, UPM retains editing rights a "2-Map" service, which will shortly be publicized on the Cogling email list, once a few reporting and reliability issues are finalised. This offers psychology and text evaluation experts direct access to some of the Dr Inventor functionalities, allowing them to compare two submitted texts directly. Note: This depends on continued use of a copy of the UPF parser downloaded from (http://backingdata.org/dri/library). The code for this parser will, however, NOT be made available.

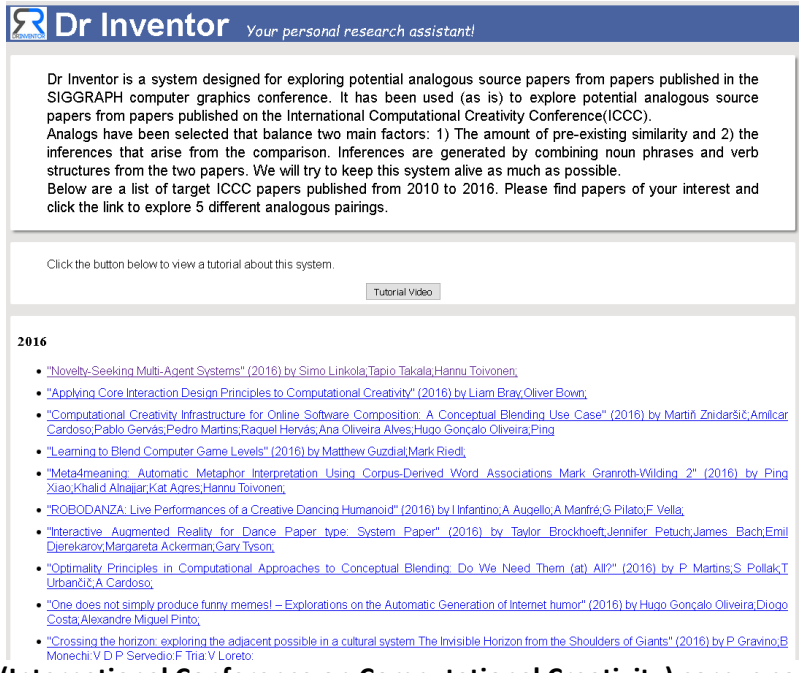


Figure 4.2 ICCC (International Conference on Computational Creativity) corpus containing all ICCC papers 2010-2016

Finally, UPM have also created an ICCC (International Conference on Computational Creativity) corpus containing all ICCC papers 2010-2016 captured in Figure 4.2. This will also be maintained for 2 years – or as long as the relevant hardware/server lasts. Note: this has no dependency on other servers of services from partner institutions.

Intellectual Property Aspects

Dr Inventor developments will be licensed under open source licenses. Any organization or individuals will be able to use and modify the codes. Partners have chosen the most relevant licenses for their developments:

UPF: Still exploring the best possibilities. The license will probably be a binary license, free for research purposes.

UPM: License Apache v2. The software is registered at the IP registry of the Region of Madrid, and is being currently licensed to a 3rd party company for its usage with their corpus of documents on the financial domain (we cannot disclose the name of the company).

NUIM: All code developed by NUIM as part of this project will be made available as open source code. This includes, but is not limited to:

- ROS mapping Software
- ROS Generation software
    - However, this is highly dependent on UPF's parsing code
- ROSAT tool (Research Object Assessment Tool) (no dependencies)

The license applied is GNU GPL 3.0 license.

Business Part

As initial developers and promoters of Dr Inventor, partners will be able to offer commercial solutions and services to help users to improve or adapt the software to their context.

The next section illustrates this point identifying the first projects, planed or already launched.

The fact that the Dr Inventor website will remain online will help a lot to promote these projects and to initiate new ones.

4.2 Exploitation projects, active or planed

Organization	Ministry of Industry, Energy and Tourism
Partner involved	UPM & UPF
Topic	In collaboration with the Spanish Ministry of Energy, Tourism and the Digital Agenda, UPM have adjusted the repository to analyze patents and public aids to the ICT sector as a support for decision makers. In collaboration with a book publisher, UPM have adapted the repository to characterize books and chapters discovering both general and particular terms as well as creating reading paths between them.
Dr Inventor components involved	Repository of indexed ROs
Planning	Started
Budget	

Organization	"Mining the Knowledge of Scientific Publications"
Partner involved	UPF
Topic	The technology developed in Dr Inventor has been already taken further in a new project ("Mining the Knowledge of Scientific Publications", PI Horacio Saggion) at UPF developed in the context of the *Maria de Maeztu Strategic Research Program* of the Department of Information and Communication Technologies (DTIC) at UPF is focused on data-driven knowledge. The strategic program is a 4 year (2016-19) research initiative funded by the Spanish Ministry of Economy and Competitiveness (with a budget of €4M).
Dr Inventor components involved	All
Planning	2016-2019
Budget	4M€

Organization	Startup to be named
Partner involved	UPF
Topic	Horacio Saggion and Francesco Ronzano are teaming together to transfer the NLP technology developed in Dr Inventor into a software enterprise. They have already started the process of registering the software and are developing a business plan to create a company which will provide text analytics services in the scientific domain. They have already made contacts with local
Dr Inventor components involved	All
Planning	Started
Budget	

Organization	A book publisher
Partner involved	UPM
Topic	In collaboration with a book publisher, we prepared the repository to characterize books and chapters discovering both general and particular terms as well as creating reading paths between them.
Dr Inventor components involved	Repository of indexed ROs
Planning	Started
Budget	

Organization	QUESTEL/INTELLIXIR
Partner involved	IXI
Topic	INTELLIXIR is a Questel product which allows users to explore patents and scientific literature using graphical representation coming from textming and statistics features
Dr Inventor components	It is plan to assess the implementation of a module, based on Dr

involved	Inventor library, to detect similarities between documents. It could help for Freedom To Operate (FTO) operations, patentability studies, opposition purpose, as well as Competitive Intelligence and Technological Intelligence.
Planning	All
Budget	Coming months

Organization	QUESTEL/INTELLIXIR
Partner involved	IXI
Topic	INTELLIXIR is a Questel product which allows users to explore patents and scientific literature using graphical representation coming from textming and statistics features It is plan to assess the implementation of a module, based on Dr Inventor library, to detect similarities between documents. It could help for Freedom To Operate (FTO) operations, patentability studies, opposition purpose, as well as Competitive Intelligence and Technological Intelligence.
Dr Inventor components involved	All
Planning	Coming months
Budget	Not defined yet

Organization	ANS
Partner involved	ANS,
Topic	Platform maintenance - ANS hosts the platform during the lifespan of this project. We will look into our own resources to continue the host beyond the duration of the project as much as we can.
Dr Inventor components involved	All
Planning	Coming months
Budget	Not defined yet

Organization	BED
Partner involved	BED, NUIM
Topic	BED is developing a number of new research proposals that involves the output of Dr Inventor by involving creativity computing to support people at retirement ages. Retirement from full-time employment has been regarded as a defining moment in the progression to later life. In addition, the once predictable pattern associated with aging and retirement is constantly changing[31]. Retirement transitions have become increasingly complex, with many older workers now choosing a "flexible" retirement such as working part time, starting new

[31] Biggs S. 2005. Beyond Appearances: Perspectives on Identity in Later Life and Some Implications for Method. Journals of Gerontology Series B: Psychological Sciences and Social Sciences 60(3):S118–28.

	employment, or doing voluntary work. In addition, the economic crisis and shifts in industrialized nations' pension policy have increased the emphasis on extending working lives. In this new landscape identities and roles are being redefined, and as such the experience of retirement and aging is now more varied than it was for previous generations. The new project will be designed as a personalized artificial intelligent coach to offer, at anytime, on-demand personalised advices, guidance and follow-up for physical, cognitive, mental and social well-being. As a personal health and well-being assistant, it will *proactively* formulate personalised coaching plan and actions for achieving personal goals based on its access to personal data captured through self-monitoring during the course of daily activities to allow for the understanding of personal needs, emotional and behavioural patterns, conditions and preferences and social environment, hence leading to *reactively* responding to high level goal directed actions to promote well-being, with further possession of *social ability* to promote social interactions among the users. The coach services will target a wide range of activities that are important to retirement transition, including physical activities, social engagement, further learning, finance, **creative arts**, emotion, diet and so on. The coach will act as a personal life-time well-being companion, who will communicate with the users in natural language conversation, giving personally tailored health advice and instructions and answering user queries in a highly interactive way.
Dr Inventor components involved	All
Planning	Coming months
Budget	Not defined yet

Organization	BED
Partner involved	BED,
Topic	Research idea suggested by Dr Inventor. BED is involved in the research of personal visualization of spatio-temporal data. Spatio-temporal pattern mining of people's everyday activities can lead to crucial insight discoveries in personal event analysis and lifestyle study. With the increasing availability of wearable sensors and apps, personal tracking data can be conveniently acquired to provide individualised visual analysis. Technology trends thus present new opportunities and challenges for personal life style analysis. In this paper, we present mLoop, a novel visual analytics tool for personal life pattern mining based on analysis of loop episodes in daily activity routes. Loops are closed episodes in an individual's activity route which may present valuable clues for pattern definition. Different from most previous work that mines patterns from trajectory data, mLoop utilises the daily activity route data tagged by the user to provide more accurate analysis of life patterns with more semantic information. Moreover, the loop extraction and

	analysis itself is highly customisable by the user to provide on-demand pattern analysis. With the strength of interactive visual analytics, mLoop allows users to easily reveal the frequent, rare or similar patterns as well as significant life patterns changes. In addition, mLoop helps the user reminiscing the past by providing visual pattern discovery and quick spatiotemporal search. Hierarchical loops are firstly extracted from daily life routes followed by comparison and clustering where user interactions play a key role to provide flexible pattern search. Three use cases that reveal user-desired frequent patterns, pattern change and help to reminisce past events are presented to demonstrate the capabilities of mLoop In the context of this research, Dr Inventor suggested to look into Principal Component Analysis for the data mining in personal data. Our initial investigation shows that this is a valid clue and we may move along this direction in the future.
Dr Inventor components involved	All
Planning	Coming months
Budget	Not defined yet

Organization	BED
Partner involved	BED,
Topic	Research idea suggested by Dr Inventor – II BED is involved in the research of personal visualization of lifestyle data for reminiscence purpose. Reminiscence is an important aspect in our life. It preserves precious memories, allows us to forms our own identities and encourages us to accept the past. It is also highly valuable for medical treatment in mental health by offering therapies to conditions such as memory impairment and depressions. Our work takes advantages of modern sensor technologies to support reminiscence, which nowadays enable self-monitoring of personal activities on a daily basis and create data containing massive and valuable information about individual movement in space and time. However, given the data size and complexity, identifying significant events from the daily tracking data for the creation of event mementos still constitutes a key challenge due to the presence of massive trivial events. This paper presents MyEvents, which is a web-based personal visual analytics platform designed for non-computing experts. It allows for the collection of a long term location and movement data, from which event-mementos can be generated through personal visual analytics. Our research focus is placed on the two goals in event reminiscences: 1) selection subjectivity, which is related to the human involvement in the creation process of the mementos, and 2) event familiarity, which is concerned with the presentation of the information related to the target events for optimal memory recall. MyEvents features new techniques to support selection subjectivity from daily events, and novel visual presentations for event mementos to evoke event familiarity. A novel

	multi-significance event ranking model is proposed, which submitted to Eurographics Conference on Visualization (EuroVis) (2017) identifies significant events in personal history according to user preferences on event frequency, regularity and categories. Interactive visualisation is used to support heuristic search for significant events underpinned by the ranking model. A novel visual presentation of the event mementos is also described. The evaluation results show MyEvents effectively fulfils the reminiscence goals and tasks. In the context of this research, Dr Inventor suggested to look into conformal mapping to rank event significance. We will continuously look into this possibility.
Dr Inventor components involved	All
Planning	Coming months
Budget	Not defined yet

Organization	BED
Partner involved	BED,
Topic	Research idea suggested by Dr Inventor – III BED is involved in the research of visual analytics for topic modeling of scientific literatures. The work involves new algorithms for topic visualization. It utilizes a corpus of over 3 thousand publications, involving keywords ranking, frequency pattern extraction and topic generation. In the context of this research, Dr Inventor suggested to use colours and curve for topic visualization. We will continuously look into this possibility.
Dr Inventor components involved	All
Planning	Coming months
Budget	Not defined yet

Organization	EPO
Partner involved	Potentially all
Topic	EPO is the European Patent Office. This organization has to main tasks - Manage the patent filing in Europe - Give a free access to the European Patents Dr Inventor could be useful here to help their examinator to check if an application (Patent demand) is effectively new and non-obvious. EPO can search in patents and journal articles to detect information which could make the proposed invention non-patentable. EPO has been contacted to offer a presentation onsite, but unfortunately they are currently not able to open a new collaboration due to high internal activities.

Dr Inventor components involved	All
Planning	Coming months
Budget	Not defined yet

Organization	WIPO
Partner involved	Potentially all
Topic	WIPO is the World Intellectual Property Organization. The goal of the WIPO is to animate and fortify Intellectual Property (IP) over the world. WIPO assess tools and methods which could help IP information users to improve their work. Dr Inventor would be assessed by WIPO specialists and then promoted through their training session and the local representative in different countries. WIPO has been contacted lately and should tell their interest soon.
Dr Inventor components involved	All
Planning	Coming months
Budget	Not defined yet

4.3 Particular example: Patent Analysis

Processes

Most of the organizations working on scientific and/or technological domains have to manage their Intellectual Property like they manage any other assets. Patents are valuable assets for such companies and it constitute the main raw material of the IP Department. Search, analyze, compare are the most frequent actions done by IP Specialist to complete the following tasks:

Freedom to Operate (FTO) Before to use or sell a technology, companies need to check if such technology is freely available. To do so they have to search exhaustively in patent databases. The goal is to use keywords describing the object of their technology.

Prior art research Before to fill a patent, inventors need to check if their invention is patentable. They particularly have to check the novelty of their invention. To do so, they have to search broadly in patent databases as well as in literature databases.

Counterfeit Research When a company have a patent, they have to check if nobody else use this technology or even try to patent the same technology. To do so they have to search and analyze product database description and patent database.

Competitive Intelligence Companies have to survey their competitors to anticipate their strategy. To do so they have to analyse their competitor patent portfolio and, if they have, their journal publications.

Technological intelligence To keep or reach the leadership in their domain, companies need to know all novelties in their domains. Web sites, patents, journal articles and lot of other sources have to be search and analyzed

Challenge

The challenge come from the fact that patents are written using a "legal" vocabulary to describe technical and scientific methods or devices. Additionally, it happens often that inventors or companies try to hide the real object of their invention. The best illustration case is: How to find a patent about bike which do not contain the words bike, bicycle, wheel, handlebar and pedal?

In such situation, semantic, ontologies and topographic analysis of the patent content help dramatically to improve the exhaustivity and the quality of the results allowing users to enlarge automatically and efficiently their research.

Problem/Solution

A specific use, particularly close to Dr Inventor capabilities, is the problem/solution issue. Often associated with Triz Method, this case is based on the fact that a similar problem could be solved by a similar solution.

In this context, Dr Inventor can efficiently help to identify similar structures of information which could drive to innovation.

This application of Dr Inventor needs to analyze a large number of information. This is probably the most interesting and promising application in IP domain. This is the one we are going to explore in QUE conjointly with the other partners.

4.4 Other Examples of Uses Which Could Happen

ANTI-PLAGIARISM SOFTWARE

Since everything is digital, almost all textual publications come from word processing software. And the software makes easy for the famous "copy and paste" action to happen.

Scientific editors, teachers, journalists, public administrations and all the institutions who ask for documents now face with potential plagiarism.

Dr Inventor components can be used to create new or improve already existing solutions to detect plagiarism. Semantic and Ontology components of Dr Inventor suite would be particularly relevant for this purpose.

AN ADVANCED FEATURE FOR SEARCH ENGINES

A search engine can retrieve documents based on the words submit by users. But it is a high value added feature to allow users to select the most relevant document, from his/her point of view, and then search similar ones. Dr Inventor components could be used efficiently in this purpose. This

needs to adapt the architecture to make it faster and scalable, and thanks to the technology used, this is doable.

SCIENTIFIC SOCIAL MEDIA

Social media servers, like Researchgate, LinkedIn and the others, offer the way to enlarge your contact network using similarities in your profile. Using Dr Inventor, these organizations could extend this feature to detect similarities among their user publications. The fact that this feature would be fully automatic is an advantage for users and servers:

- The user does not need to fill any form but just submit their papers
- Servers enrich their offer with powerful features

OTHER POTENTIAL PARTNERS

Two other entities identified could be interested by Dr Inventor components:

- SemanticScholar.org from Allen Institute for Artificial Intelligence. This Institute has been founded by Paul G. Allen, co-founder of Microsoft in 1975. Semantic Scholar provide a search engine indexing scientific literature. Documents are automatically categorized using semantic algorithms. Search results page display facets based on these categorization, allowing users to narrow their research easily.
- Chan Zuckerberg initiative: Created by Mark Zuckerberg (Facebook CEO) and his spouse Priscilla Chan (pediatrician), this Company helps projects dedicated to children health and education. Among the projects, Biohub (https://czbiohub.org) has the mission to “to invent the future of life science research”.

PATENT ANALYSIS

Most of the organizations working on scientific and/or technological domains manage their Intellectual Property like they manage marketing, sales, legal and other departments. Patents are valuable assets for such companies and it constitutes the main raw material of the IP Department. Search, analyze, compare are the most frequent actions done by IP Specialist to complete different tasks. These tasks could be improved using Dr Inventor technologies.

FREEDOM TO OPERATE (FTO)

Before using or selling a technology, companies need to check if such technology is freely available. To do so they have to search exhaustively in patent databases.

PRIOR ART RESEARCH

Before filling a patent, the inventors need to check if their invention is patentable. They particularly have to check the novelty of their invention. To do so, they have to search broadly in patent databases as well as in literature databases.

COUNTERFEIT RESEARCH

When a company has a patent, they have to check if nobody else use this technology or even try to patent the same technology. To do so they have to search and analyze product database description and patent database.

COMPETITIVE INTELLIGENCE

Companies have to survey their competitors to anticipate their strategy. To do so they have to analyze their competitor patent portfolio and, if they have, their journal publications.

TECHNOLOGICAL INTELLIGENCE

To keep or reach the leadership in their domain, companies need to know all novelties in their domains. Web sites, patents, journal articles and a lot of other sources have to be searched and analyzed

Dr Inventor technologies could, in these processes, improve the range and quality of the results allowing users to expand automatically and efficiently their research.

4.5 SWOT Analysis

Table 4.1 SWOT Analysis Table

	Helpful	Harmful
Internal origin	Strengths	Weaknesses
	• Multiple organizations based • Multiple international level experts based • Based on latest IT technologies: Saas mode, HTML5 frontend, NoSQL Databases, Web Services linked • Social Media spirit	• Multiple organization: with time, need to keep these organizations connected to maintain the Dr Inventor developments up to date • Dr Inventor needs a high level of security, confidentiality and performance if we want Dr Inventor solution used by Industry
External origin	Opportunities	Threats
	• Scientific and Intellectual Property Information market is growing up • The scientists renewal make this population more and more comfortable with communication and social media based solutions	• Big players like Google, Microsoft, IBM or Facebook are developing solutions which can compete in a way with Dr Inventor components • In lot of domains, users want to use simple and straightforward applications. This trends increase the need of simple User Interface and fast results

4.6 Conclusions

Dissemination is essential for projects like Dr Inventor to bring attention from the key stakeholders. This report highlights the dissemination and exploitation activities carried out in the last year of the project. During the final year, the primary focus of the consortium was to make the project visible in the research community as well as to the general public. Concerning dissemination activities, all the major activities of the project were presented in detail including public website, online articles, video-clips and social networking. More technically oriented results (papers in conferences and journals, the workshops, evaluation events) are also included. Dr Inventor system is a test bed to ensure early adoption of its approaches within the community as a solid foundation for future European and world-wide research. The dissemination activities aimed at communicating project results to a wide audience, fostering the adoption of project results and its impact, facilitating the exchange of information and the interaction with other projects in industry and academia.

Major dissemination activities such as workshop (CASA 2016 and SIGGRAPH 2016) have made big contributions to spread the information of the project and hopefully influencing the scientific and industrial communities. Project activities have been accomplished through the collective effort of all members of the consortium.

The dissemination activities of the project not only shared key high-level messages related to the ultimate project objectives and the expected impact, but also the focused messages related to intermediary objectives and outputs. The Consortium has proactively raised awareness of the project and attracted interests from all related stakeholders by formulating adequate messages and communication approaches in a “stakeholder-specific” manner. Throughout the project the dissemination activities about the project results and the implications of these results have been embraced to all relevant target groups: the general public; research and technology communities; regulatory authorities; relevant initiatives; relevant industries; and the media.

Many academics, especially those in the field of computer graphics, have been well informed of our developments with the persistent efforts from all partners of the consortium. Feedbacks from and personal communications with academics have been very encouraging. Dr Inventor brings to the academic community a completely new way to stimulating their research creativity. Many colleagues in the research community have been well inspired and excited by the novel ‘personal research assistant’ concept. A good example is that our BU partner have developed a new research project in flower simulation which is almost completely inspired by Dr Inventor.

Through the workshops and talks given by the consortium partners, we have reached out to a lot of researchers who have found the idea of Dr Inventor enlightening. Not only will the current development be helpful in assisting their research tasks, many researchers have also applied the concept in their mental creative exercises, leading to deeper and wider insight into their research topics.

Dr Inventor provides an opportunity to create a Saas application, and to develop and improve components which match perfectly with the market needs. The experience provided by these three

years of work from the best European teams and experts bring a must-have solution to all the organizations who face the challenge of coping with an abundance of information of this era.

The desire of the partners is to continue to provide this solution and the associated expertise as they have already done for several business projects. For this reason, the exploitation of this project shows a perfect achievement and a very promising future.

Appendix 1 – New Dissemination materials for SIGGRAPH 2016

WP9 task 9.3 “Workshop” (Task Leader: BU), has developed the following Dissemination materials.

Dr Inventor Flyer for Tech Talk

Dr Inventor Business Cards

Activity ICT (FP7-ICT-2013.8.1)
Grant agreement no: 611383
Funding: Over 2.6 Million EUR

Project Coordinator:
Prof. Feng Dong

Scientific Coordinator:
Dr. Diarmuid O'Donoghue

Project Website
http://drinventor.eu

University of Bedfordshire

UNIVERSITAT POMPEU FABRA

Bournemouth University

Maynooth University
National University of Ireland Maynooth

Universidad Politécnica de Madrid

ImageMetry
Image Processing & Computer Vision

Questel

The research leading to these results has received funding from the European Union Seventh Framework Programme ([FP7/2007-2013]) under grant agreement no 611383.

DRINVENTOR
Your Personal Research Assistant

SIMULATE CREATIVE THINKING
STIMULATE USES IDEAS
HYPOTHESIS DISCOVERY
COGNITIVE COMPUTING
DISCOVERY SCIENCE
SCIENTIFIC CREATIVITY
EVALUATE IDEAS
DISTANT ANALOGIES
CREATIVE IDEAS
SCIENTIFIC (R)EVOLUTION
PSYCHOLOGICALLY INSPIRED
COMBAT PROBLEM FIXATION
SURPRISING CONNECTIONS
STRUCTURED DOCUMENT COMPARISON
INSPIRE ME
EVALUATE COMPARISONS
CHALLENGING INFERENCES
FOCUSED ON COMPUTER GRAPHICS

DRINVENTOR
Your Personal Research Assistant

Dr Inventor is built on the vision that technologies have great potential to supplement and even enhance human ingenuity by overcoming the limitations that people suffer in pursuing scientific discoveries. Dr Inventor is an original system that provides inspiration for scientific creativity by exploiting the rich availability of web-based research resources. Dr Inventor acts as a personal research assistant, utilising machine-empowered search and cognitive computation to bring researchers novel and thought provoking perspectives for scientific innovation.

Dr Inventor has been developed with a particular focus on the discipline of computer graphics and SIGGRAPH authors. You have the opportunity to benefit by using Dr Inventor as well as guide its future development through your feedback.

WHAT IS ANALOGY?

Dr Inventor is built on a cognitive model of the human ability to reason using analogies. An analogy is a comparison between two seemingly different ideas, which highlights some non-obvious similarity. Many scientists are familiar with the notion that a development in one field of research can have significant implications in another seemingly unrelated field. For instance, an approach developed to solve a problem in one domain may be just as (or even more) applicable to another discipline.

For example, we might say that preparing to take an exam is like training to run a marathon. You need to have a lengthy preparation, devote enough hours to your daily preparation and the day before, you need to get a good night's sleep! This and other analogies compare two ideas that are not normally seen as similar – exam preparation and marathon training.

Thinking through the use of analogies appears to be an innate part of what makes us human. The cognitive process of analogy plays a key role in surprisingly diverse mental processes, from learning and noticing to induction and deduction. While particularly useful analogies become almost universally adopted, such as: time is money, discovering novel and truly useful analogies is very challenging. This is the challenge set before Dr Inventor.

Analogies can be very powerful but they can also be misleading. Analogies cannot be blindly trusted and require careful evaluation. Is preparing to run a marathon like taking an exam? Well, if the exam preparation style was built on excessive last minute study (cramming) the night before an exam. You would surely not prepare for a marathon by cramming all your training into the night before a race! Thus, Dr Inventor is a Creativity *Support* Tool (CST) with adoption or rejection of its analogies involving expert evaluation.

ANALOGIES IN SCIENCE

The use of analogies abounds across the sciences; from Ernest Rutherford's analogy between the solar system and the atom to Michael Faraday's use of lines of iron filings to think about electric fields. Even our understanding of current scientific challenges such climate change are impacted by competing analogies to different topics.

Studies have shown that many practising scientists use analogies on a daily basis. For example, a plant scientist might use an analogy between different parts of the same plant to explain some experimental discoveries. Or they might use an analogy to a different plant (or organism) to explain some particularly unexpected results. When they are trying to formulate an hypothesis they might use an analogy to a very different discipline, such as politics or engineering.

INDICATIVE TECHNOLOGIES

The following are some of the main technologies used by Dr Inventor to discover novel and potentially useful analogies between scientific publications.

- Text extraction from .PDF: multi-column, headers, footers, equations, tables, page numbers…
- Co-reference resolution recognizes that the word "it" in the following sentence refers to algorithm - *"The algorithm … and it …"*
- Citation aware parser, correctly interprets sentence structure and the role played by citations within the sentence.
- Ontological Categorisation: Categorizes sentences using a discursive ontology, with categories including {Background, Problem, Approach, Future Work etc}
- Graph Construction: Focuses heavily on the main terms within each sentence: *"**We** begin this paper **presenting** a new **algorithm**."* Composite graphs are constructed for each paper.
- Graph Matching: Identifying analogies employs a graph matching algorithm, whose efficiency relies on employing semantic, lexical, pragmatic and other constraints.
- Topic Modelling: based on the document corpus, focused on publications in computer graphics.
- Analogy visualisation: highlights some of the similarities underlying the analogy.

POSSIBLE USES OF DR INVENTOR

- Inspire Me based on one of my papers
- Search for comparable work in oth sub-disciplines
- Explore Analogies for other papers
- Evaluate Abstract for a proposed publication
- Find template paper from another discipline, f use as a guide to write your paper
- Explore Topic Model that was generated from tl corpus
- Visualise novel similarities between publications

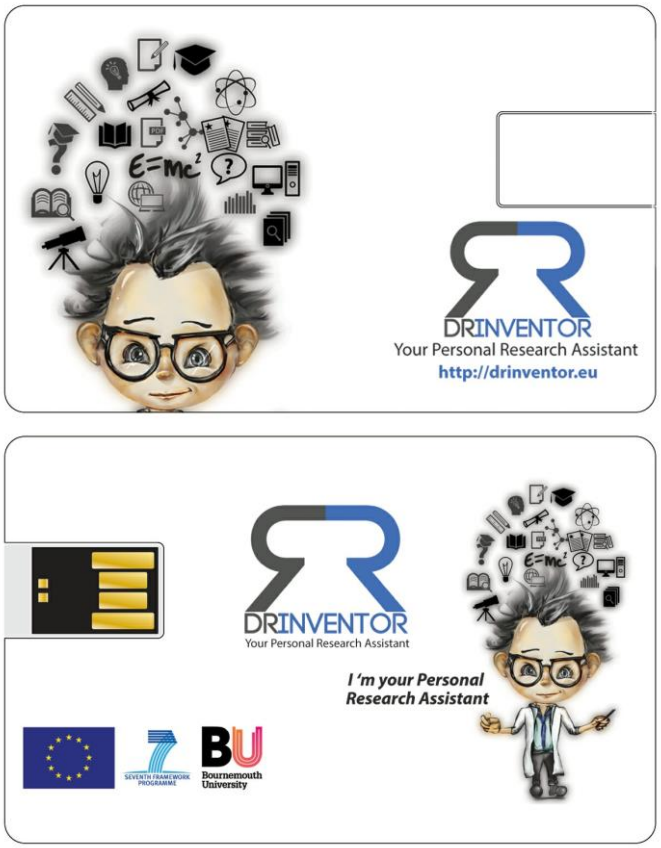
USER STORY EXAMPLE ANALOG

Dr Inventor has revealed an analogy between tv unconnected problems of computer graphics, whi could lead to novel solutions to other resear problems. The first from 2002 was concerned wi high-dynamic-range image construction, where lig management and under/over exposure photography need to be dealt with. The second fro 2009 is concerned with the problem of occlusions ar noises during 3D laser scanning. Both are fro different domains of computer graphics and mo researchers would not normally see any usab similarities between these papers.

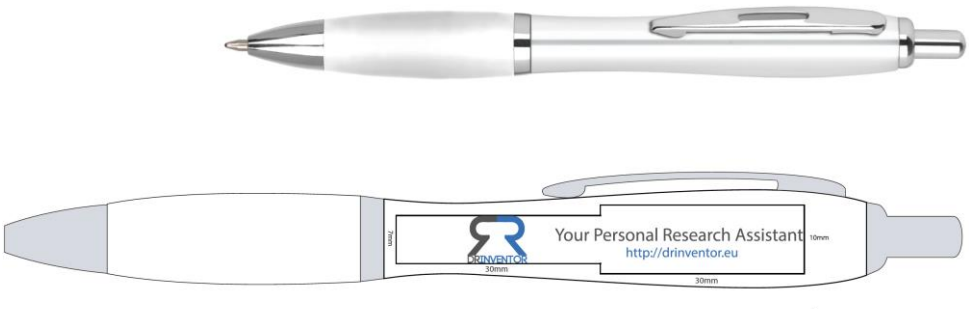
The analogy was rooted in a comparison between t term *"area"* in the first paper and *"hole"* in the secor In both cases, the commonality is to identify ar recover the missing information taking into accou their inherent structures, which are points for the las scanning problem, and colour details for the HI problem. What's more interesting is by making use this analogy, similar methodologies can be sought f other problems in the future where missing data are be recovered, such as motion capture, fac expressions, image based shape reconstruction.

Note: *Curve skeleton extraction from incomplete poi cloud (2009) was from the topic of image processing a photograph. The second Fast bilateral filtering for t display of high-dynamic-range images (2002) concern 3D modelling and point cloud.*

Dr Inventor 4 page Brochure



Dr Inventor personalised USB

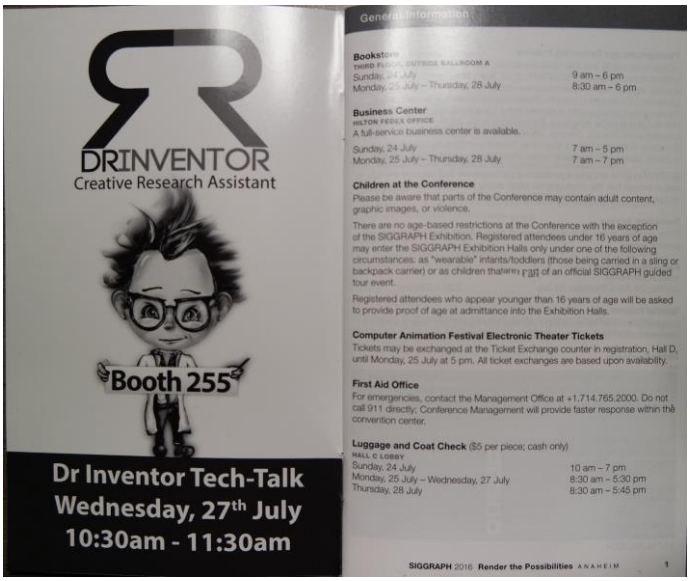


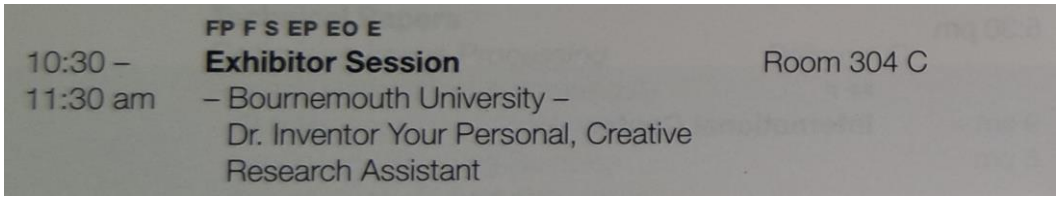
Dr Inventor personalised Pen

Dr Inventor Banner for SIGGRAPH 2016 Booth

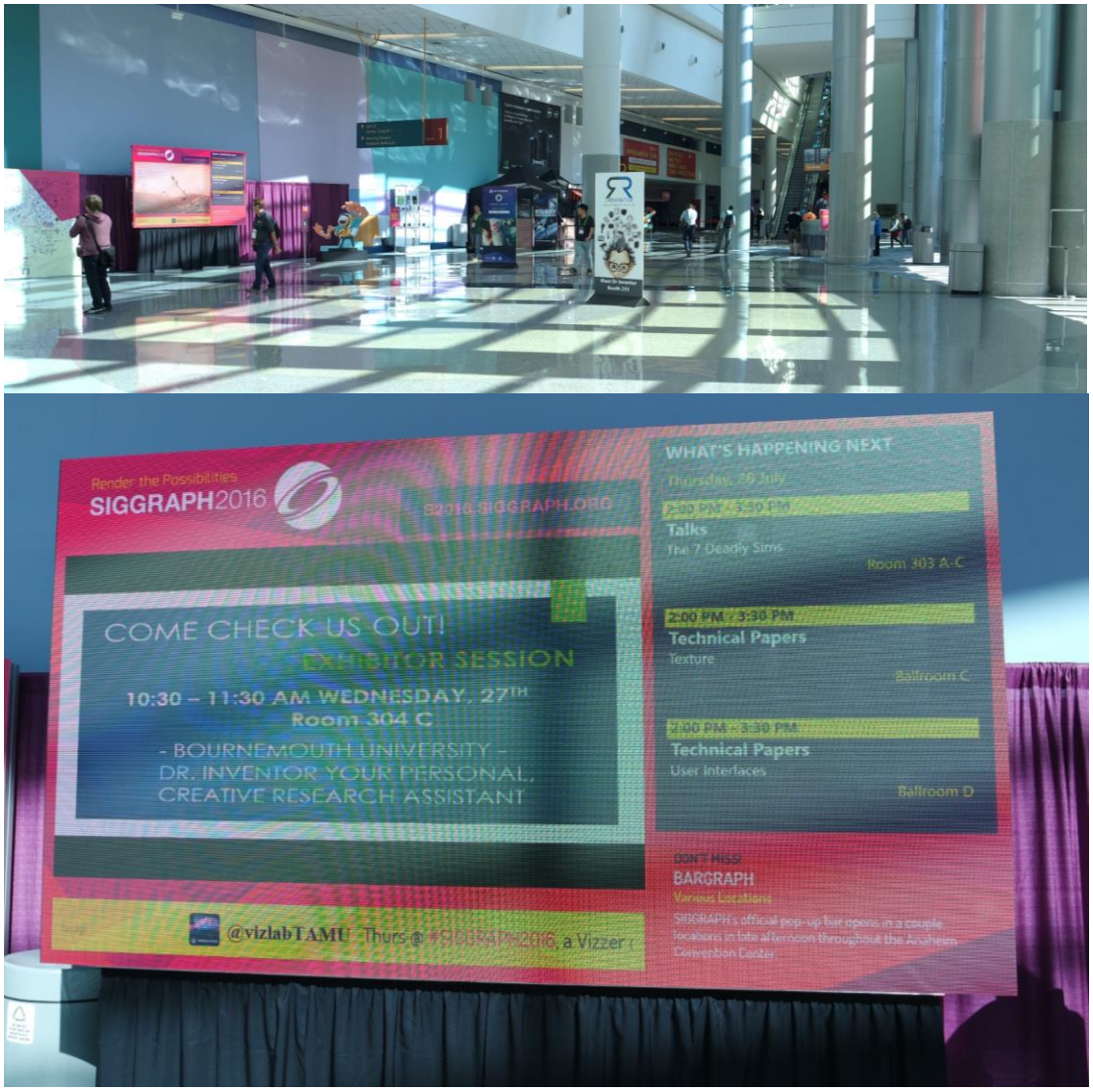
Dr Inventor Roller Banner

Dr Inventor Banners at SIGGRAPH 2016 Conference





Dr Inventor Advert in SIGGRAPH Conference Locator



Dr Inventor project Video and Advert on SIGGRAPH 2016 Billboard

Appendix 2 – Abbreviations and acronyms

ANS	Ansmart Ltd
BED	University of Bedfordshire
BU	Bournemouth University
CHIC	Computational Horizons In Cancer
CGI	Computer Graphics International
CASA	Conference on Computer Animation and Social Agents
CGIV	Computer Graphics, Imaging And Visualization
DC	Dissemination Committee
GUI	Graphical User Interface
NUIM	National University of Ireland Maynooth
ROS	Research Object Skeletons
SIGGRAPH	Special Interest Group on Computer Graphics and Interactive Techniques
UPF	Universitat Pompeu Fabra
UPM	Universidad Politecnica De Madrid