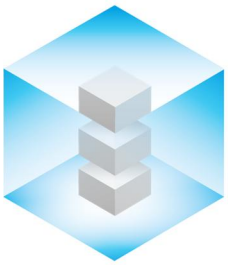


SCOLIO-SEE

3D Image Processing System for helping physicians in the diagnosis and monitoring of Scoliosis

Grant Agreement Number FP7-SME-2012-1-315217
Coordinator: Ateknea Solutions Catalonia, SA

Final Report
Publishable Summary

Project Coordinator: ATEKNEA Solutions Catalonia, S.A.

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement number FP7-SME-2012-1-315217

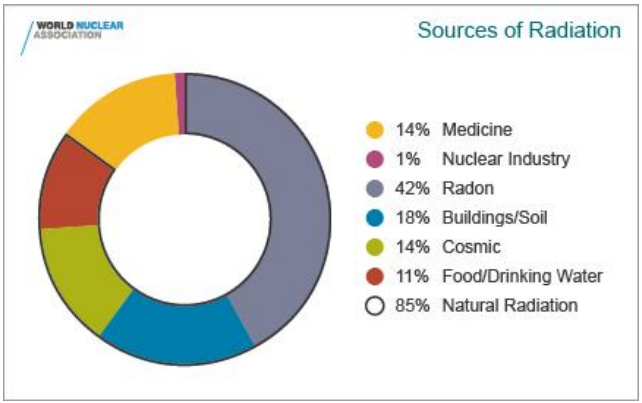
Executive Summary

Any change that has a positive impact on citizens' health is relevant for all the European government agencies and companies involved in the medical and health sector.

Although it is known and recognized that the repeated usage of x-rays in the medical imaging context, has negative long-term effects on the patients' health, it remains nevertheless a common practice to identify and diagnose the internal causes of a trauma. The X-Rays permit to assess at a time the causes of the pain and to respond of the need for surgery that in itself is also a risk.[1]

The x-ray technology is part of the many human paradoxes, in the same way as our usage of fossil energies, a problem to a solution, the fossil fuel emission control, the Kyoto protocol. In the medical context, the sanitary protocols as to radiation exposure are controlled by safety procedures based on the dose rate (Sv), the time the body is exposed to that dose. To put the problem into perspective, a spinal X-ray correspond to the radiation per hour detected at Fukushima site (+1 day after the disaster), around 1.4 millisieverts (mSv), when the average dose of natural background radiation per person per years (varies widely) is around the 2.2 millisieverts (mSv)[2].

Whereas the usage of fossil energies is widely disputed and identified as one of the main causes of the climatic and environmental changes that will, directly or indirectly affect all the aspects of our social environment. On a scale not so far from this, it remains that the radiations from the Medical Sector represent 14% of the total amount of emitted radiations on the earth and the remaining 85% are from natural radiation[3].



From a technical and physical point of view, the reduction of emitted radiation by radiation-free system usage, presents the technical challenge of trying to lower our exposure energy band, while maintaining information content of an X-ray scan[4] [5].

The SCOLIO-SEE project contributes to European policy objective *Council Directive 97/43/Euratom of 30 June 1997 on health protection of individuals against the dangers of ionizing radiation in relation to medical exposure, and repealing Directive 84/466/Euratom* by developing a technology to reduce or substitute radioactive techniques in the detection of scoliosis in children. The development of this technology as applied to healthy diagnostic or monitoring choices will encourage the development of radiation-free systems and contribute to the healthy living agenda.

[1] http://www.world-nuclear.org
[2] http://www.informationisbeautiful.net/visualizations/radiation-dosage-chart/
[3] http://www.world-nuclear.org/info/Safety-and-Security/Radiation-and-Health/Nuclear-Radiation-and-Health-Effects/
[4] http://www.sprawls.org/ppmi2/XRAYCON/#Recorded%20Image%20Contrast
[5] http://www.sprawls.org/ppmi2/BLUR/#INTRODUCTION%20AND%20OVERVIEW

Summary description of project context and objectives

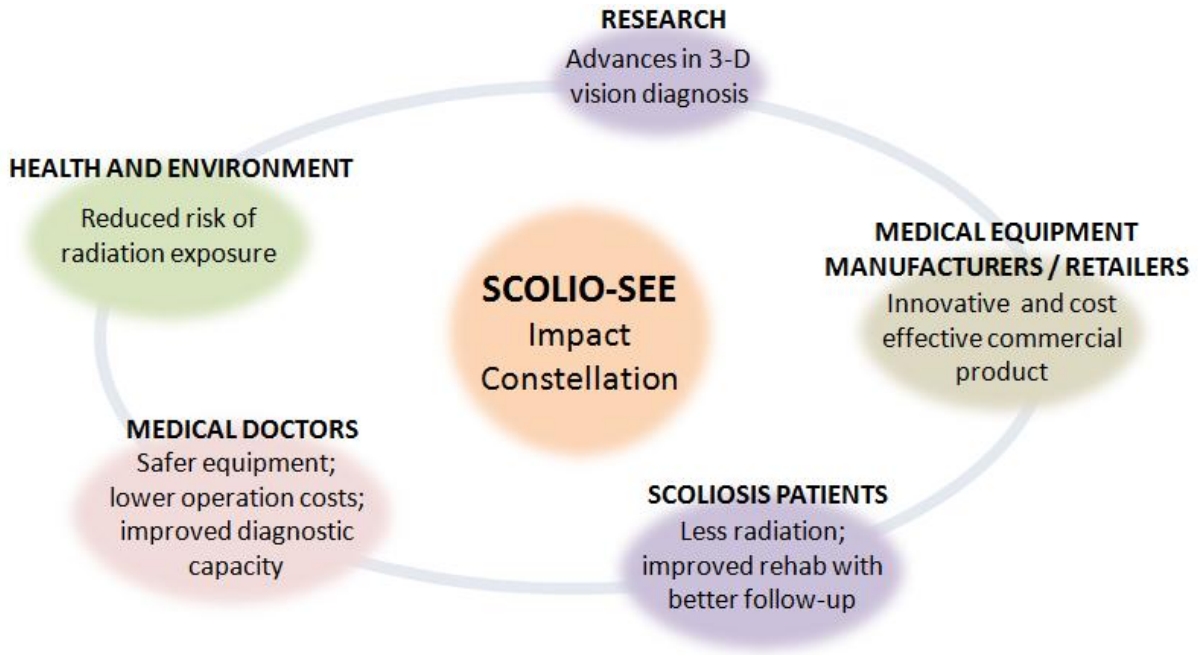
SCOLIOSIS is a three-dimensional deformity of the human spinal column, characterized by a side-to-side curvature of the spine and usually combined to rotation of the vertebrae. There are around 1.8 million people with scoliosis throughout the EU and presents at any age, but it is most common in children over 10 years of age, and is of paramount importance for the health and self-esteem of juveniles.

SCOLIOSIS diagnosis begins with the inclinometer, a tool designed to measure the trunk asymmetry, if there is a suspicion of scoliosis, generally, an X-ray is prescribed to establish the underlying cause to the curvature. By measuring the Cobb Angle[6], the golden standard metric, the physicians quantifies the scoliosis grade.

SCOLIO-SEE is a system that should facilitate the diagnostic and the monitoring of the spine; while reducing radiation exposure needs.

The SCOLIO-SEE approach is constructed around the extraction of the shared information between; radiological acquisitions; topographical acquisitions from the external surface of patient back; a set of physical measurements acquired manually; a set of processed parameters, in order to know if the spine behavior can be inferred, from the free-radiation acquisitions, spaced in time; in complement of an artificial neural network (ANN) working over the whole data of patients participating to the Scolio-SEE project

The SCOLIO-SEE project is subject to the ethical rules of data protection and privacy.



[6] https://en.wikipedia.org/wiki/Cobb_angle