



MNBS Meeting – VECTOR project: microrobotics enabling the next generation of wireless endoscopes

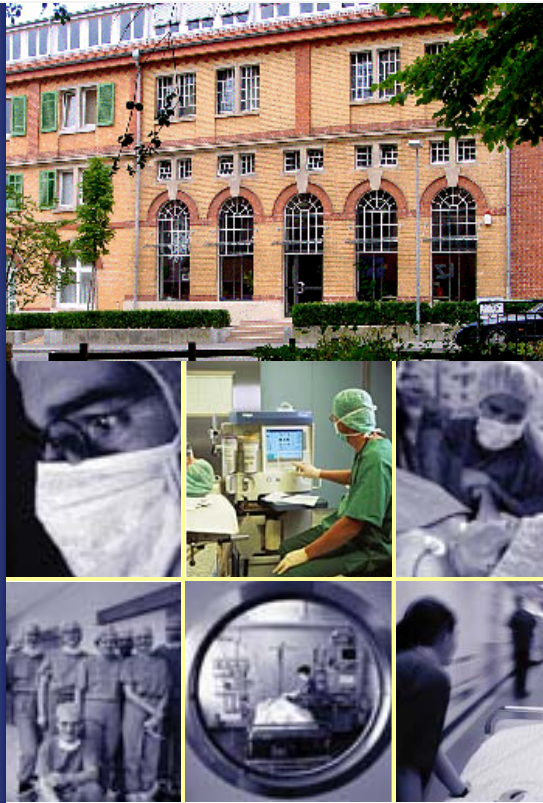
Project overview

Neuchatel, February 16th, 2010

For the VECTOR consortium

Marc O. Schurr



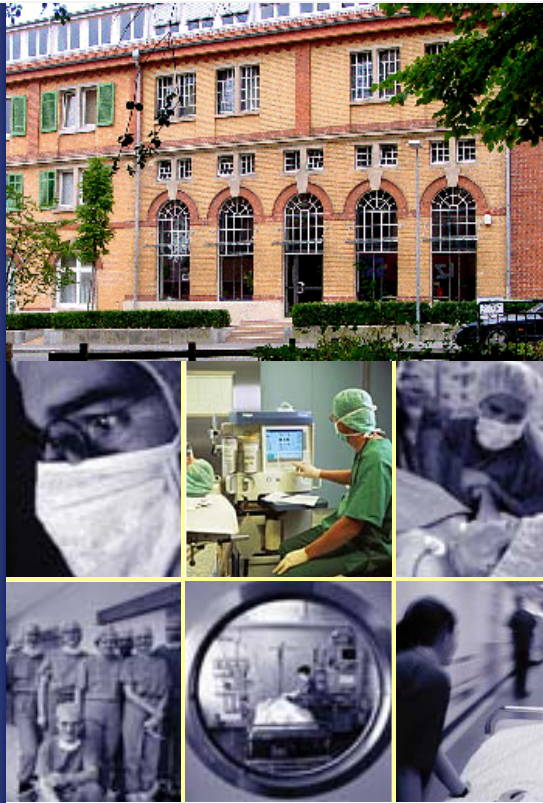


1 Project background

2 Project status

3 Key technology capabilities

4 Key challenges



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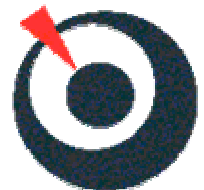
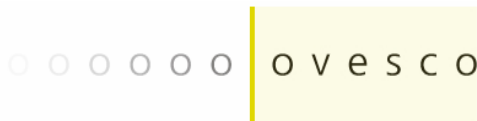
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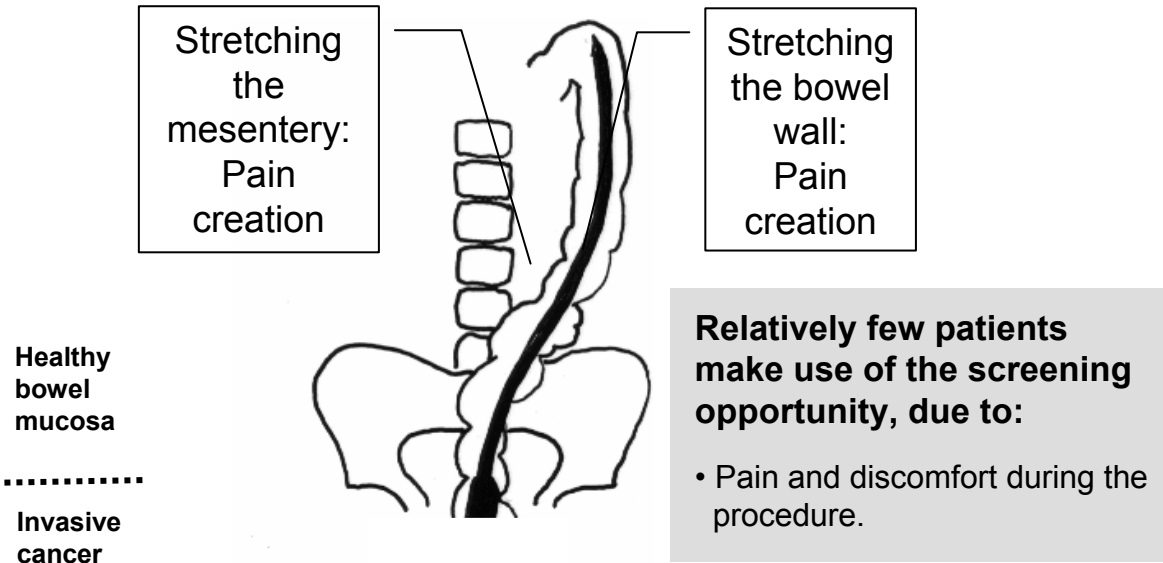
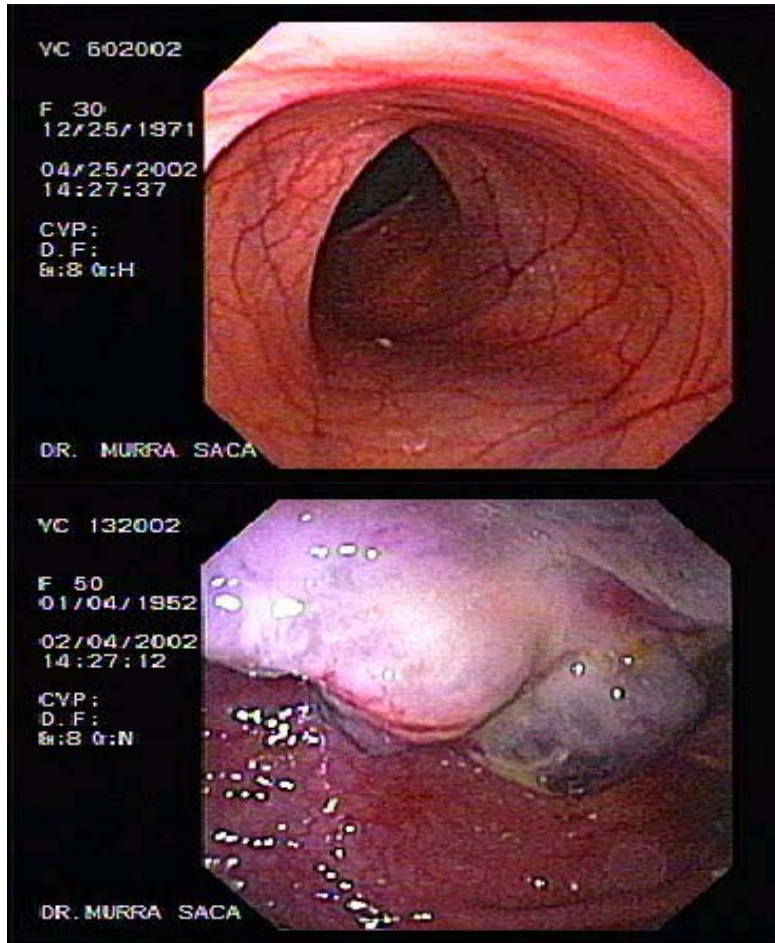
The VECTOR consortium.

The consortium has strong know-how in all areas of the VECTOR project, based on extensive prior research in the field of the respective partners.



Clinical problem-unmet market need.

To capitalize on the time gap between benign and malignant disease, painless endoscopy technology is needed



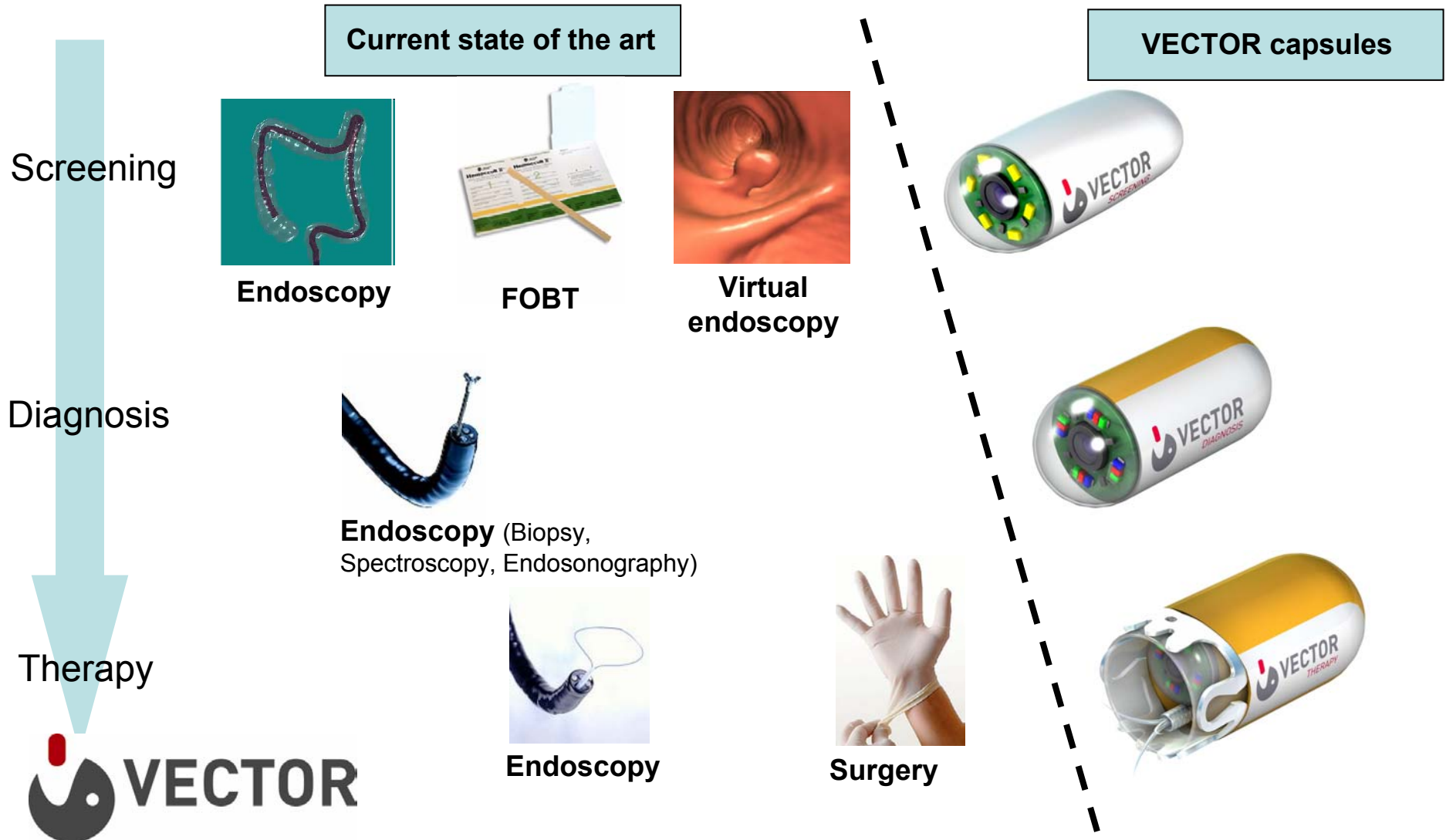
Evidence supporting the concept of early detection & treatment:

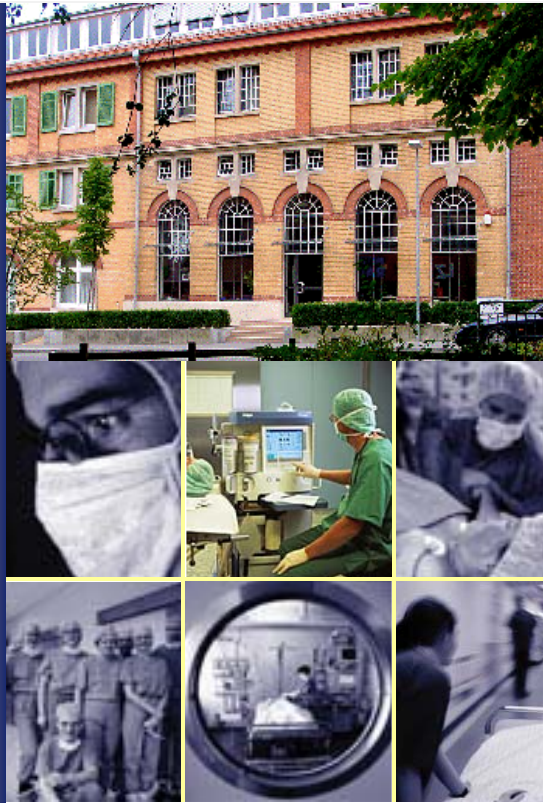
- Screening endoscopy reimbursed in many EU healthcare systems
- Literature widely supports screening endoscopy, e.g.:
- Literature widely supports early treatment of pre-malignant and early malignant lesions, e.g.



VECTOR system.

The VECTOR project realizes an entire endoscopic capsule system comprising novel capsule features for diagnosis and treatment to compete against the medical state of the art.





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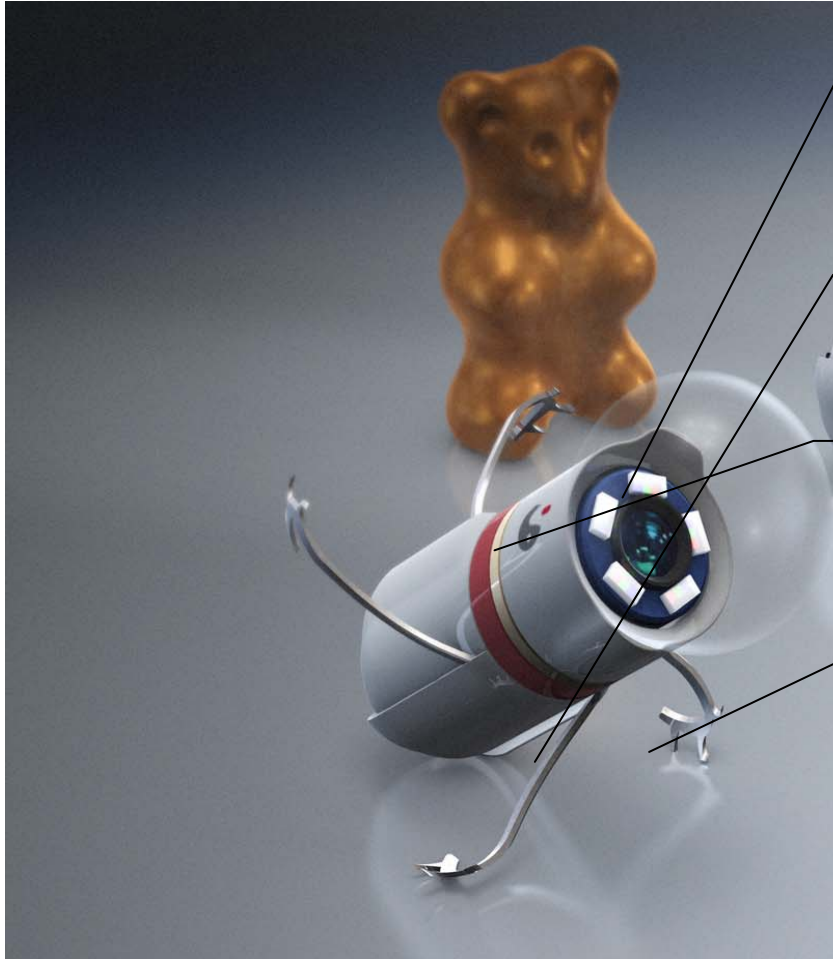
2 **Project status**

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VECTOR status.

The functional units of the VECTOR capsule can be broken down into core capsule systems for the basic capsule functions, locomotion systems, diagnostic systems and therapeutic / biopsy systems.



Core capsule systems: optical system, telemetry and power systems, navigation etc.

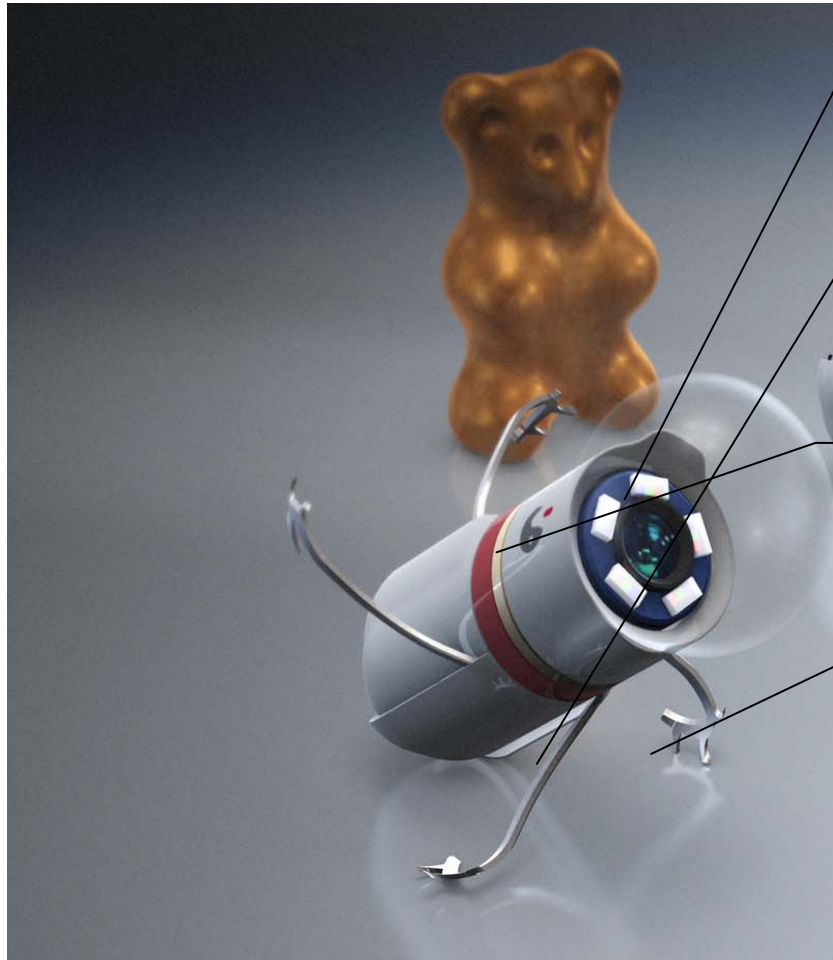
Locomotion system: actuators for mobility.

Diagnostic system: sensors for enhanced diagnosis

Therapeutic / biopsy system: devices for tissue manipulation

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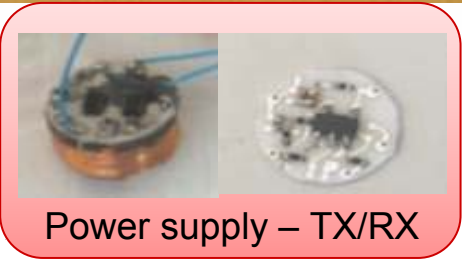
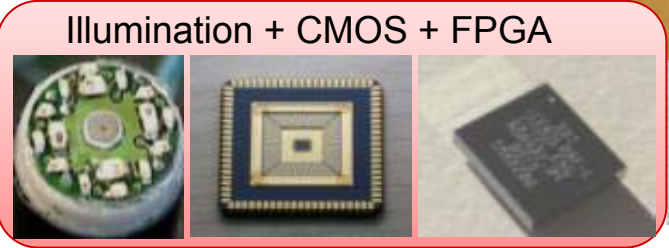
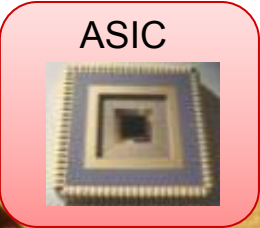
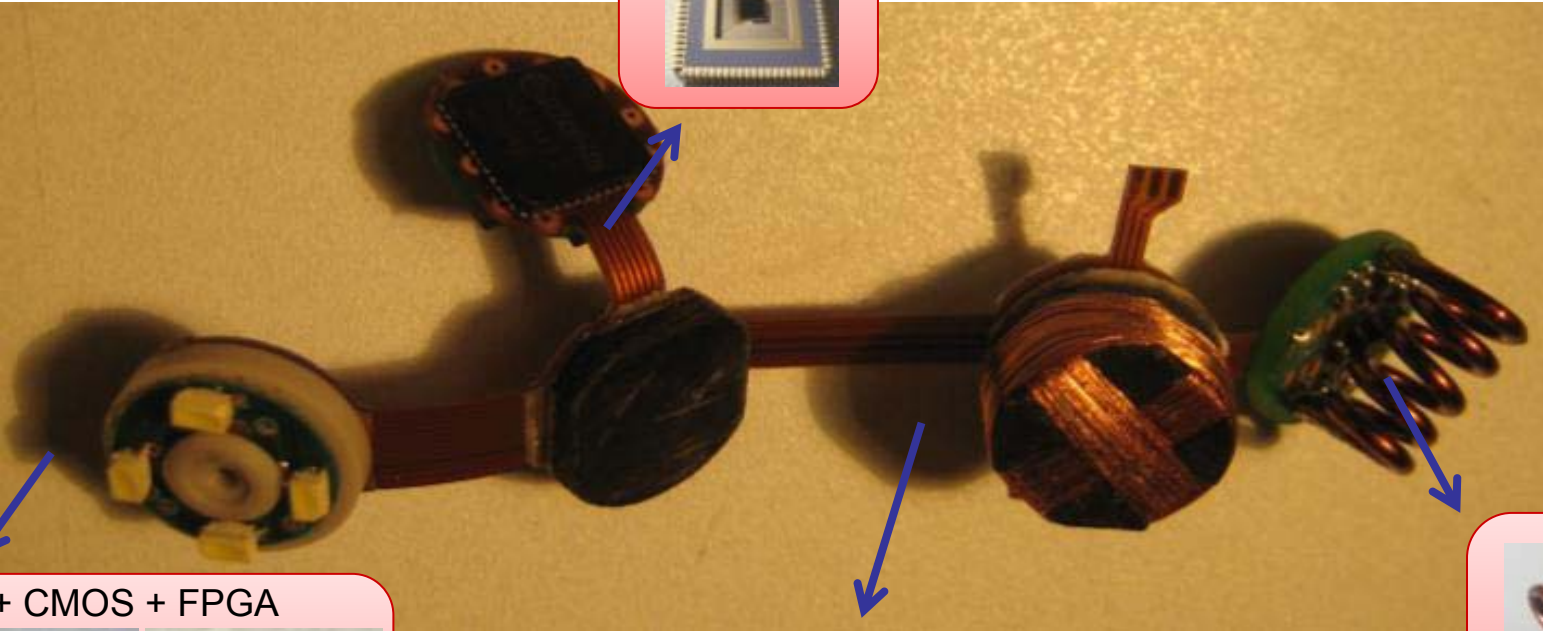
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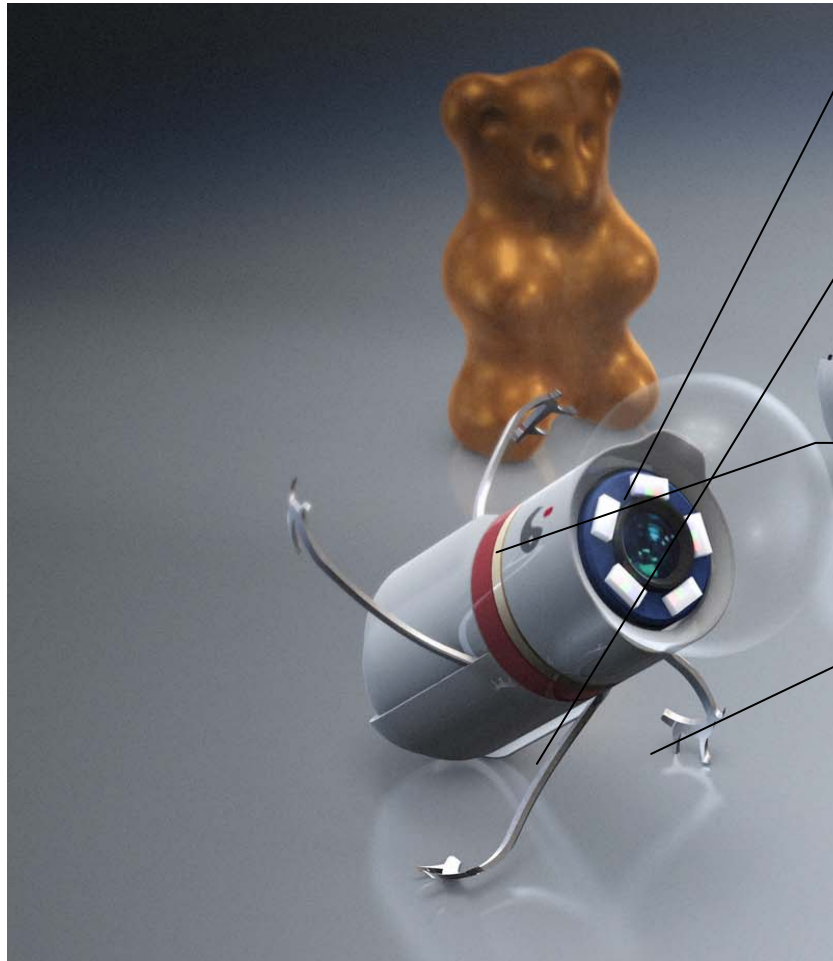
VECTOR Status

Current status of the technology: all functional components of the robotic capsule ready for Prototype packaging.



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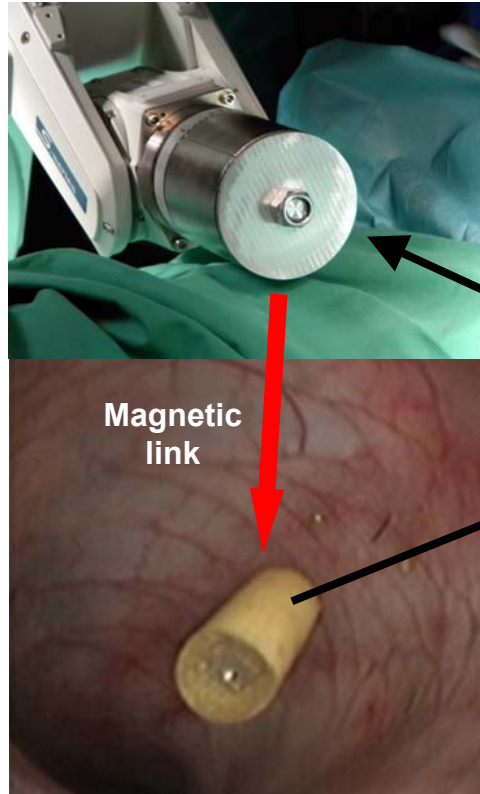
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VECTOR status.

Locomotion – smart capsule locomotion with sensor feedback control. *Fly by wire*



Robot control

Magnetic link

Sensor Feedback (acceleration sensor)

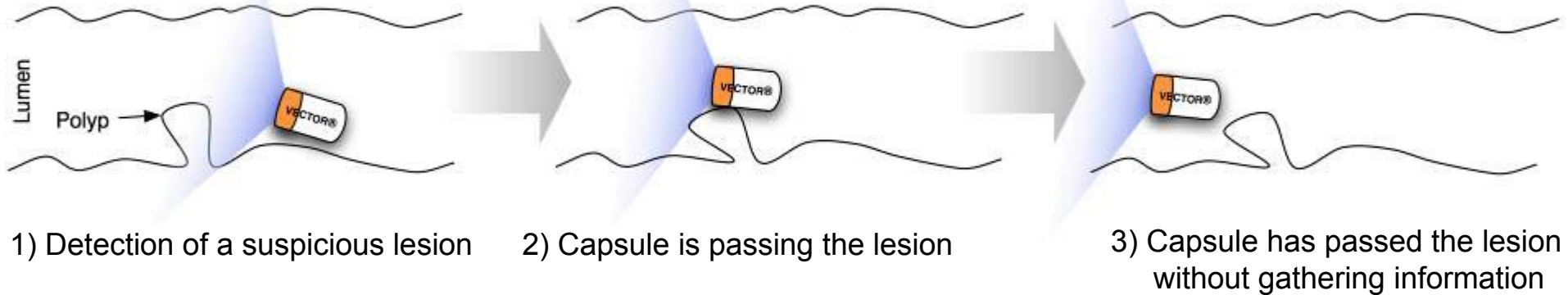
User input



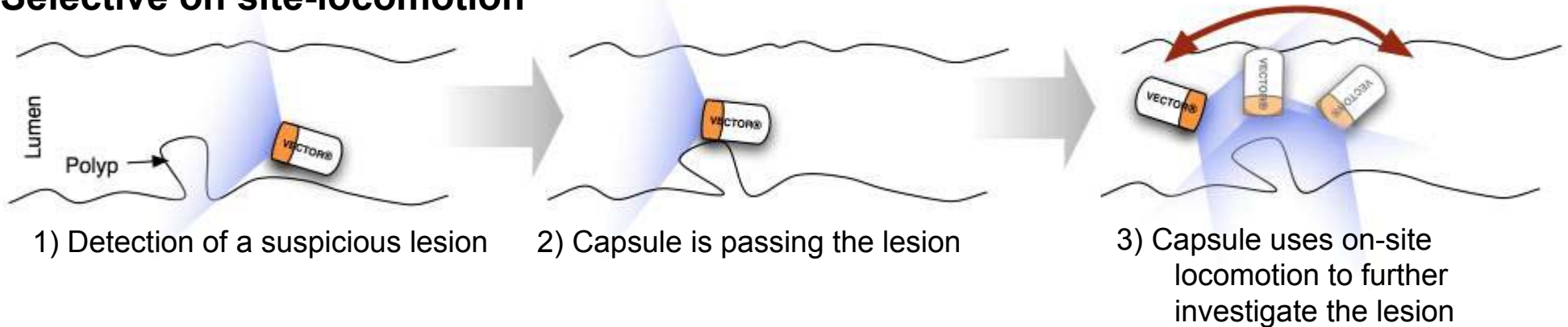
Medical background and conditions of use.

Active on-site navigation provides energy saving means to greatly improve the diagnostic quality of capsule endoscopy.

Passive locomotion



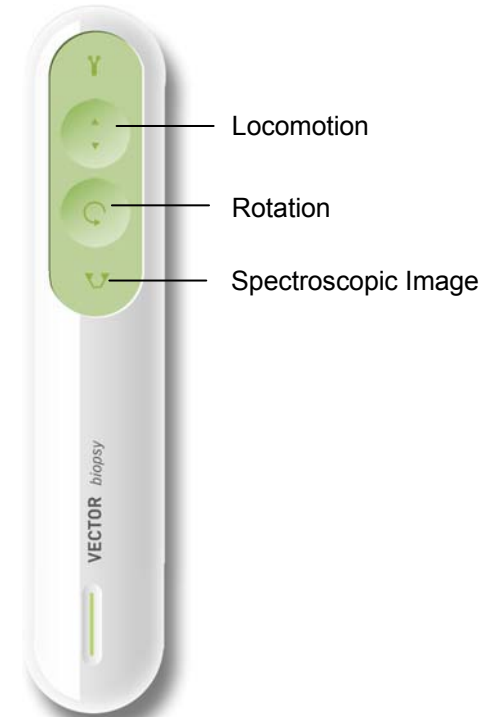
Selective on site-locomotion



VECTOR status.

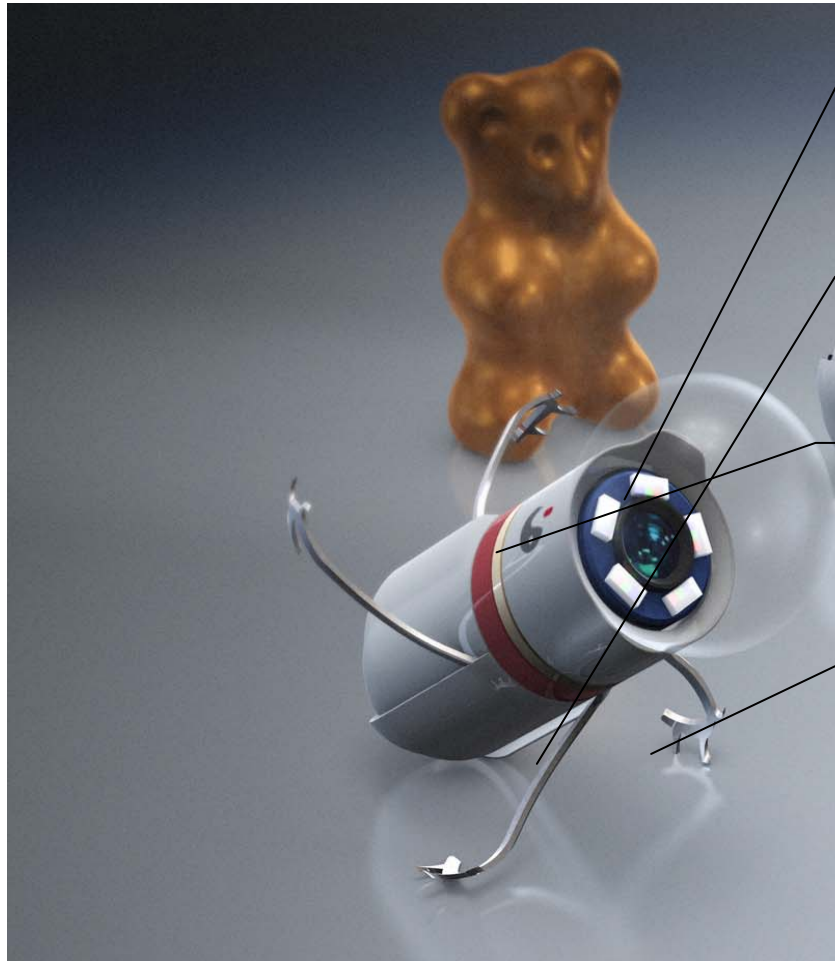
Diagnostic capsule.

Procedure



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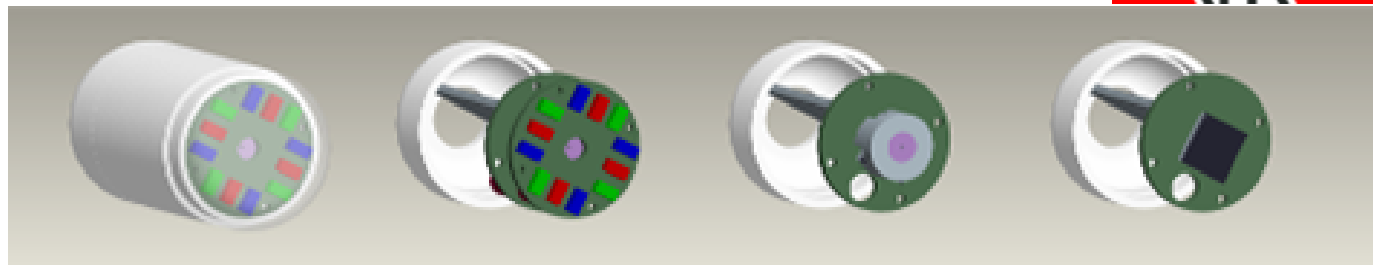
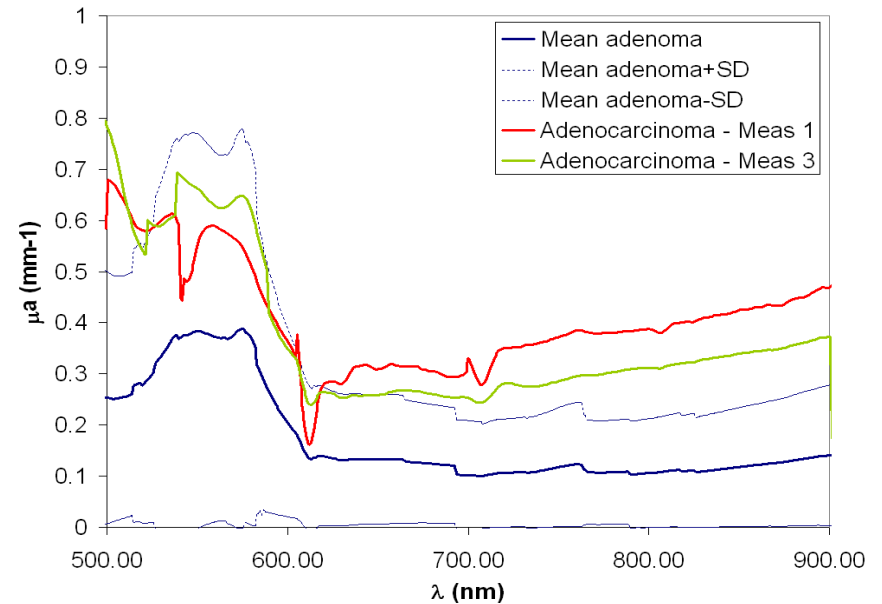
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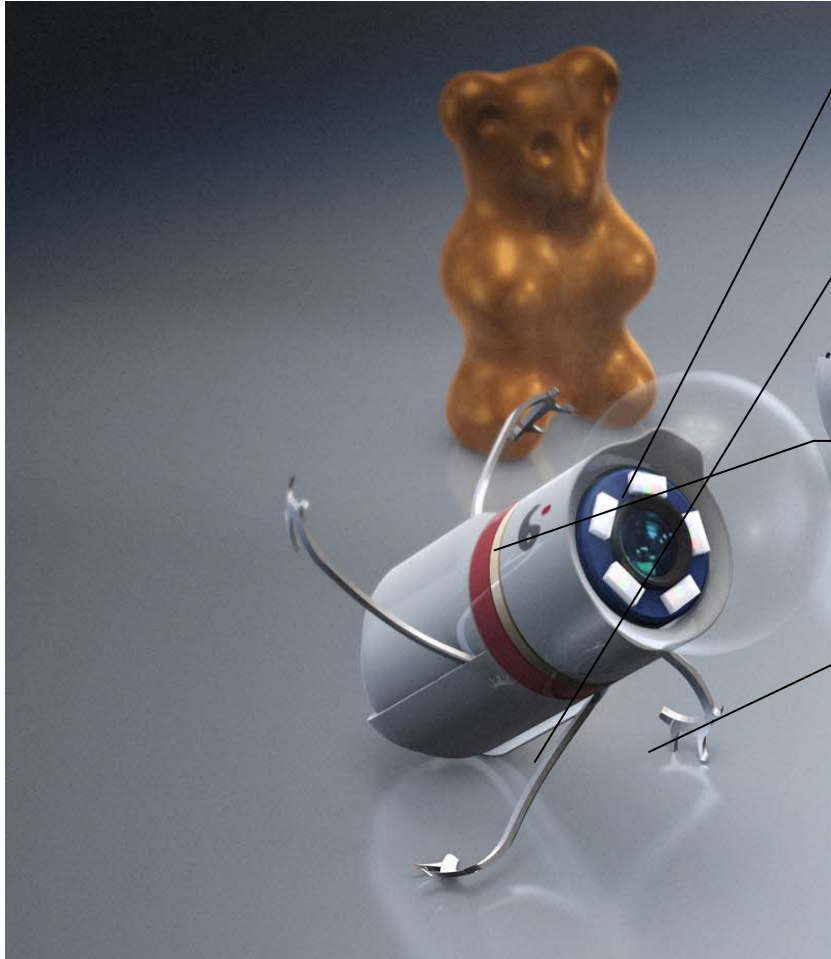
Diagnostic system – combination of enhanced spectral diagnosis with the vision system.

- ❑ Optical measurements were performed on resected tissue samples during a clinical trial. This showed that tissue differentiation is achievable through spectral data analysis
- ❑ The first prototype of an optical imaging sensor was designed
- ❑ Alternative sensor: A study of various CMUT principles concluded that an appropriate ultrasound sensor with adequate performance for correct examination of GI tract lesions can be implemented into the capsule



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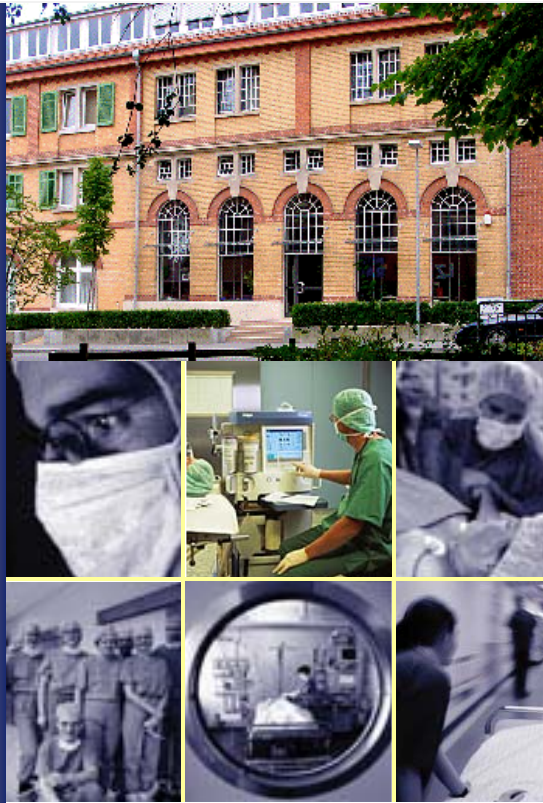
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Research on therapeutic capsule endoscopy and clip release via wireless capsules.

Wireless VECTOR capsule approaching bleeding lesion





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VECTOR: Key technological challenges.

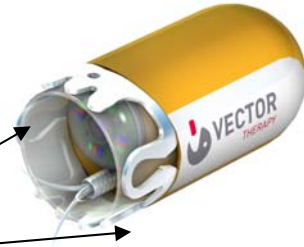
The consortium is facing integration-related challenges.

System integration

Challenge: Space constraints and prioritization of modules



Challenge: Combination of therapeutic module with diagnostic capsule



Management of energy

The enhancement of capsule functions over the state of the art results in particular energy requirements.

Fundamental decision between inductive Powering and batteries.

Feasibility of both alternatives with other Features of the VECTOR capsule, such as magnetic locomotion is under evaluation.

Annex.

Contact.

In case of questions please contact:

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