

SUCCESS STORY



Improve autonomous navigation and obstacle avoidance

The amazing VIKINGS team's robot has been the winner of the first two steps of the challenge ARGOS. Its autonomous navigation relies on several sensors: odometry prediction, fused with Ellipse-A inertial sensor information, then corrected by two LiDAR. With this winning combination, VIKINGS team reaches a centimeter-level absolute precision (< 3 cm).



CLIENT

ESIGELEC

APPLICATION

Land Robot Autonomous Navigation

PRODUCT

Ellipse-A Miniature Attitude and Heading Reference System

PROJECT

Improve autonomous navigation and obstacle avoidance

Launched in December 2013, the ARGOS (Autonomous Robot for Gas and Oil Sites) Challenge is organized by the oil and gas company TOTAL with the French National Research Agency (ANR). It aims to bring out in less than three years a new generation of autonomous robots able to perform inspection tasks, detect anomalies and respond to emergencies. The objective of this competition is to build an autonomous robot capable of moving on oil and gas sites in order to enhance the security of TOTAL operators.

Five teams from Austria, Spain,

France, Japan and Switzerland have already challenged themselves in the first two competitions of three. The French team named «VIKINGS» composed of the IRSEEM / ESIGELEC laboratory and the company SOMINEX, won these two first steps. The competition remains tight, the winner of the Challenge will be appointed in spring 2017 after the last competition.

AUTONOMOUS NAVIGATION, AT THE CORE OF THE CHALLENGE

Robots are tested at Lacq, a city in the South West of France, on a site reproducing oil and gas

«The Ellipse-A provides very good pitch and roll performance thanks to low drift gyros»

Pierre Merriaux
Embedded Electronic Systems Manager IRSEEM/ESIGELEC

SUCCESS STORY - LAND ROBOTICS

platform main elements. The robots must operate autonomously on the platform. The Challenge requests the robots to perform inspection tasks such as gas measurement, pressure gauge reading, valve position determination, etc. The robots must also detect obstacles and then return to their first location. The ability to autonomously detect alarms and the ability to autonomously move on the site are among the criteria on which the VIKINGS team has distinguished themselves.

ODOMETRY - INERTIAL SENSOR - LIDAR, THE WINNING COMBINATION

VIKINGS's robot computes its position thanks to the fusion of odometry prediction and inertial sensor data. This information is then corrected with data from the two LiDAR (the first one is positioned in the front and the other one in the back, for a field-of-view of 360 °). The robot is equipped with caterpillars, so the robot slides when

it rotates. This type of vehicle makes the odometry accuracy especially bad. The inertial system is therefore essential to calculate the heading. Roll and pitch are obtained from the Ellipse-A and fully entrusted.

Already satisfied with SBG SYSTEMS' products, the choice was naturally the ellipse-A attitude and heading reference system. «It provides very good pitch and roll performance thanks to low drift gyros» says Mr. Merriaux. The Ellipse-A is the second generation of miniature inertial sensors of SBG Systems. It integrates low drift gyroscopes and benefits from the experience gained in algorithms design. Industrial-grade, the Ellipse-A is factory calibrated in temperature and dynamics, ensuring data integrity from -40 to 75 ° C.

With this winning combination, VIKINGS team reaches a centimeter-level absolute precision (< 3 cm), a technical achievement, which has greatly contributed to their two victories.

The next and final step will take place in March 2017. The teams will have to expect even more complex tasks and will have to demonstrate that their robot meets the ATEX / IECEx standard, which means being ready to operate in potentially explosive environments. We wish the best to the team VIKINGS!

■ Hélène Leplomb
May 2016



KEY FEATURES

- » Up to 0.2° Roll & Pitch Accuracy
- » Low noise and Low drift Gyroscopes
- » Factory Calibrated in Temperature and Dynamics
- » Light-weight, Low-power



ABOUT THE VIKINGS TEAM

VIKINGS consists of two perfectly complementary entities. IRSEEM is a research institute specialized in electronic embedded systems. It is part of the ESIGELEC engineering school, which lead for more than ten years applied research to support innovation in areas such as automotive, aerospace, and energy. SOMINEX is an SME company specialized in complex mechanical systems engineering and prototyping.

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More information:

<http://www.argos-challenge.com/en/team-vikings>