The INBOT Team Description Paper 2015

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Abstract. The INBOT are an interdisciplinary RoboCup team   International institute of Robotics, Slovenia. The team has a history of contributions in the areas of mechanical design, computer vision, PCB design. The team members have participated in RoboCup leagues since 2010, placing first and second several times in the past. In 2015 the INBOT team has participate in European robotics competition in Portugal and achieved second place. For this year INBOT team has decided to participate on RoboCup 2015. Team has decide to make it's one platform for Robotino V.2. This document summarizes the history of the INBOT team, describes the roles of the team members, gives an overview of the INBOT robot, their software system.

1   Introduction

Team members from INBOT the International institute of robotics, Slovenia, competed in national mazebot competitions from 2007-2011, RoboCup Junior League from 2010-2012, within the Junior Rescue A and B League and in 2012 they've started to compete in different competitions like Robotour and Freebots.

The INBOT team members have had a strong record of successes in: national mazebot competitions 7 fist places total, RoboCup Junior rescue A in Singapore achieving first place , RoboCup Junior rescue A in Turkey achieving second place. In 2012 they compete in RoboCup Junior Rescue B in Mexico City, achieving a third place. In 2015 they compete in RoboCup Portugal in Freebots League and achieved second place.

The main goal of INBOT team is to compete in RoboCup and try to impress young people to take part in RoboCup competition. Our mission is to contribute to a responsible development and application of robotics for RoboCup competition and general use. The INBOT also aligned with SUDO institute which aims to develop universal robotic platform witch will be able to autonomously plow snow, clean parking lots, parking houses, etc… Platform is currently

working semi-autonomous (guided by smart phone app), but in the next 6 months is going to be upgraded to a totally autonomous robotic platform.

The INBOT commit to participation at RoboCup 2015 upon successful qualification. We also commit to provide person, with sufficient knowledge of the rules, available as referee during the competition.

2   History of the INBOT and team members participation at RoboCup

Team members of INBOT participated at RoboCup 2010 in Singapore in RoboCup Rescue A League (1st place). They also participated and succeed in RoboCup 2011 and 2012, Junior Rescue A and B Leagues, obtaining many top three placements.

In 2015 INBOT team has achieved 2.nd place in RoboCup Portugal open.

The INBOT joined the Festo Logistic League in 2015 with the Festo Robotino V.2 platform. One of the things that team first started working on, is making new electric gripper and construction for upgrades. Team is now focusing on video-processing and mapping.

3   Background of the INBOT Team Members

- *Arne Korsika* is studying for a Bachelor of science in software engineering and a Bachelor of engineering in biomechanics. His main work is in software development (computer vision and map routing algorithms).
- *Ales Stojak* is studying for a Bachelor of science in electrical engineering. He works on designing PCB and programming embedded systems. His main interest is in designing mixed signal circuit boards, analog circuit analysis and optimizing communications in embedded systems used in robotics.
- *Tadej Tofant* is studying for Bachelor of engineering in Biomechanics and Chemistry. He works on mechanical designing for bionic systems and advanced light constructions. He is also interested in adaptive manufacturing by 3D printing.
- *Peter Pernat* is studying for a Bachelor of engineering in mechatronics. He works on projects for auto industry.
- *Matjaz Turk* is studying for a Master of science in Mechanical engineering. He works on projects for pharmaceutical company's.
- *Urban Gobec* is studying for a Bachelor of engineering in Biomechanics. He works on designing web pages and graphical interphase.
- *Dr. Martin Terbuc* is a professor and senior researcher in college of Ptuj. His main subjects are robotics and controllers for robotics mechanisms. He provides software support for the team.

– *Marjan Bezjak* is a professor and researcher in college of Ptuj. He works on designing advance robotics system. He provides software support for the team.

4 Hardware and Software Overview

INBOT team uses Robotino ver. 2 robotic platform with upgrades. These feature a use of external laptop computer for mapping and orientation, laser scanner from sick, a webcam, PIXY camera and a modified gripper.

INBOT team uses an open source PIXY camera for detecting raw material at mps stations. Camera outputs pixel coordinates of each detcted object that has been saved in its memory. Orientation in space is done by preloading a basic map that consists of room size, raw material pickup and drop area and number of mps stations in the room. Mps station position and its orientation is detected using laser scanner while robot is in operation. Webcam is used to detect mps station's status by recognising semaphore's color.

INBOT team's detailed hardware modifications and software will be freely available on our website: inbot.eu

5 Acknowledgement of Use of Code

The INBOT team robot uses Robotino View code release. This is Festo made licensed software for programming and operating Robotino platform, used to connect external PC to Robotino. INBOT team also uses modified PIXY open source camera code for object recognition and tracking.

6 Research Areas

Robot Vision: Vision is one of the research areas that INBOT team is working on it. Several subtopics have been investigated including object recognition, edge detection, model fitting and color classification.

Indoor navigation: Indoor navigation based on basic preloaded map that contains constraint regions, room size and number of points of interest and use it as an overlay to a laser scanner generated map to ease orientation.

Development of Robotino gripper and carrier: The team has made the first prototype of Robotino gripper and carrier. Final goal is to make cost efficient upgrade for Robotino, that can be used as an alternative in RoboCup Festo Logistic League.

Road edge and lane detection: Team members done a research on robot vision for detecting lane crossing and road edge detection using hugh transformation, canny edge and color separation.