

Robocup Rescue

IUTMicrobot Robotics Team Description

<http://www.ecerc.org/IUTMicrobot>

Contact Name:

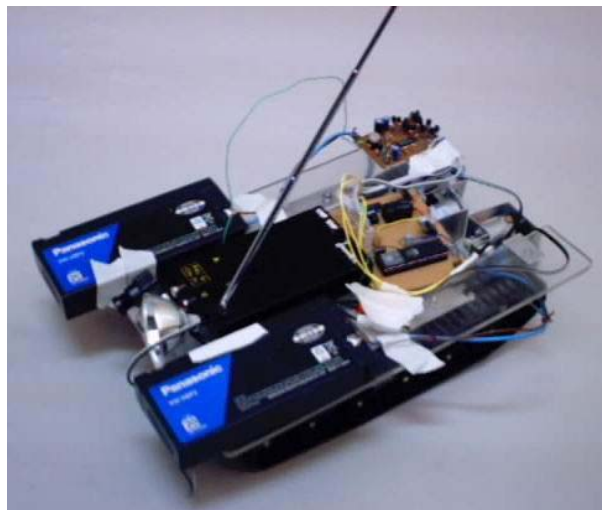
Hamid MirmohammadSadeghi (sadegi_m@cc.iut.ac.ir)

Members:

Hamed Bastani (bastani@cc.iut.ac.ir)

Ehsan Azarnasab (azarnasab@hotmail.com)

Ali Shariatmadari (shariat@pershia.net)



Electrical and Computer Engineering Research Center
Isfahan University of Technology

(ECERC – IUT)

84156, Isfahan, Iran

<http://www.ecerc.org>

tel: +98 311 391 2480

fax: +98 311 391 2481

Robocup Rescue *IUTMicrobot Robotics Team
Description*

<http://www.ecerc.org/IUTMicrobot>

About :

IUTMicrobot team was formed 1998 . The major activities are in Robotics fields, like RoboRescue, RoboDeminer, MazeSolver, Target Finder,... . We have received two Robotics Awards so far (1st place in Robodeminer 2002 ,Tehran & 2nd place IntelligentMice 2001,Tabriz).

It is now affiliated by ECERC (Electrical and Computer Engineering Research Center) in IUT (Isfahan University of Technology).

RoboRescue Project (RRP):

Linking mechanics, electronics, software, etc. creates a robot. Our system is made up of these parts:

- Mechanics (Static parts / Dynamic parts)
- Electronics (Power circuits / Interface circuits)
- Communications (Robot to server and vice versa)
- Gathering information systems (Camera / Sensors)
- Localization (Absolute / Relative)
- Software (Control class / Process (Audio and Images))

A brief description of different fields and tasks is as below:

I- RRP Mechanical structure and locomotion :

Left and right motors are controlled separately. Our movement system is composed of parallel wheels. In this method we can easily control both “V” (linear velocity) and “W” (rotational velocity). Final plan dimensions are 720*210*300 mm³.

II- RRP Localization:

There are two localization methods.

- a. Positioning the robot in pitch surrounding by Ultrasonic Transceivers and relative coordination of objects.
- b. Absolute coordination of robot By means of some calculations to change systems (r, è) to (x, y, z) and merging gathered

information, we can localize both robot and victims situations. Then a map including walls, rubble, path and victims situations will be created by means of some simple matrix calculations.

III- RRP Sensors (Victim identification and surround scan):

- a. Visual data is provided by CCD cameras (Analog).
- b. Audible data is provided by a simple microphone and additional amplifier (Analog).
- c. The Sonar sensors are used to distinct different objects (victim, rubbles, walls, etc) (Digital).
- d. A light sensor on robot disables or enables the Robot's lamp depending on surrounding light condition.
- e. Presence of Co₂ is checked using proper sensor.

IV- RRP Software and Control :

The software part is made by Delphi using needed components.

- a. The main parts of software are Image Processing and Audio Processing units for detecting victims.
- b. Another part of the program calculates the coordination using received data from CCD and ultrasonic sensors.
- c. Controller unit chooses the action of robot considering the environment condition.
- d. Reporting unit that prints out a 3D map (x, y, z) including victims' situation, walls, rubbles, etc.

V- RRP Communication:

For less robot's weight and volume, the processor is outside and is called Server. So we need a full-duplex communication channel. Environment's data (Video / Audio / Sensors outputs)

are sent to Server (Digital and Analog). Then Server sends some Digital commands to robot.

VI- RRP Electronics:

- a. The source of energy is provided using 3 parallel (12 V/2 Ah) batteries. Stabilizers, filters and regulators prepare the proper voltage for each part.
- b. Outputs of sensors are converted to digital using converters and interfaces.
- c. A set of 89C51 controllers manages interfaces.