Robocup Rescue

IUTMicrobot Robotics Team Description

http://www.ecerc.org/IUTMicrobot

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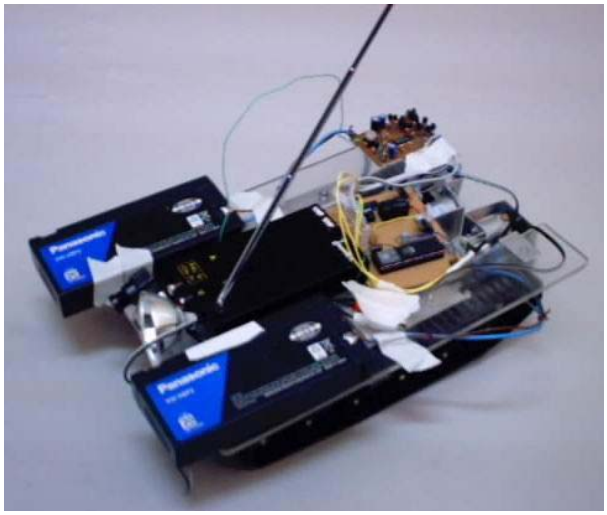

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Abstract:

These pages contain the IUTMicrobot team description and its Robocup Rescue Robotic project. The team was formed 3 years ago. We started with 4 people and followed some Robotics projects. Now the team with 3 members is going on, affiliated by ECERC (Electrical and Computer Engineering Research Center).We are all under graduated students of Electrical and Computer Engineering Department in IUT (Isfahan University of Technology). One of the future programs is Robocup Rescue.

Introduction:

As is known, Robotics researches include different fields. 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- Mechanical structure:

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 ω (rotational velocity). Final plan dimensions are 720*210*300 mm^3.

II- Electronics:

a. The source of energy is provided using 3 parallel (12 V/2 Ah) acid 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 and PCBs.

III- 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.

IV- Gathering information system:

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.

V- Localization:

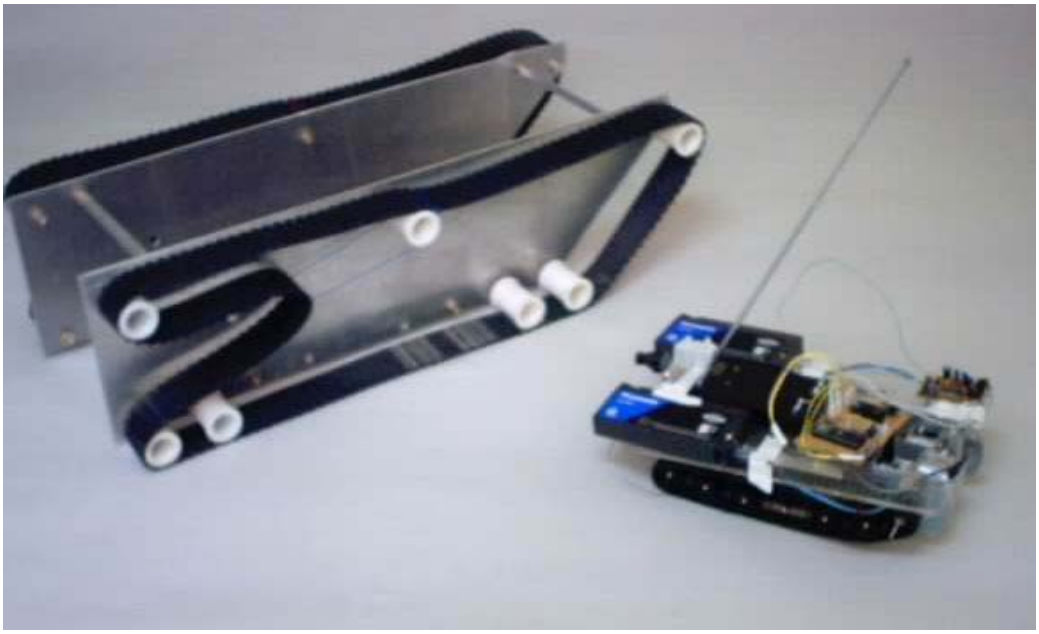
There are two localization methods.
a. Positioning the robot in pitch surrounding by Ultrasonic Transceivers and relative coordination of objects.
b. Absolute coordination of robot.

By means of some calculations to change systems (r, θ) 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.

VI- Software:

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.



Final case Demo model