The MRL 2010 Mixed Reality Team Description

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Abstract—**This paper describes the main research focus of Mechatronic Research Laboratory (MRL) Mixed Reality team entering the LARC 2010 competitions. MRL's activities including software development, artificial intelligence and electronic achievements are described in this paper.**

I. INTRODUCTION

MRL Mixed Reality Team has started its work since 2008. During these two years our team has attended in two previous Iran Open and International RoboCup competitions. The results achieved by MRL are two first places in Iran Open contest and one 3rd and one 4th place in International RoboCup competitions. Our team had many developments and contributions in these years such as artificial intelligence, robot mid board, Radio Frequency module and Visual Operator module. In the rest of this paper we will explain our previous contributions.

II. ROBOT MIDDLE BOARD

Because of Continuous burning of head board's AVR microcontroller we had designed and made a middle board. In this middle board we have used motor driver, receipt 34 pin connector and a charger IC. Also this middle board has capability of charging robot by USB, but this part is not completed yet and already we are working on it. By using motor driver had resulted to stop the revert current to AVR micro.

In addition of complete tests of mid-board in our lab, we had used it at all of the robots in RoboCup 2010 without any malfunction. Also we got confirmation of CITIZEN company agent in ROBOCUP 2010 to add this mid-board to Eco-Be Robots.
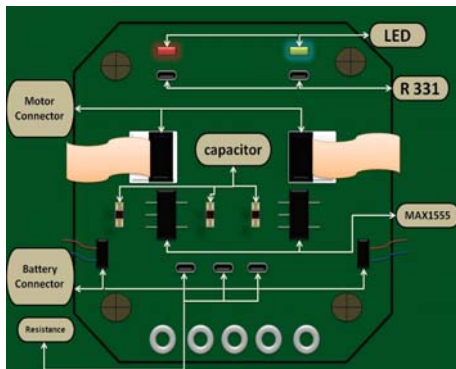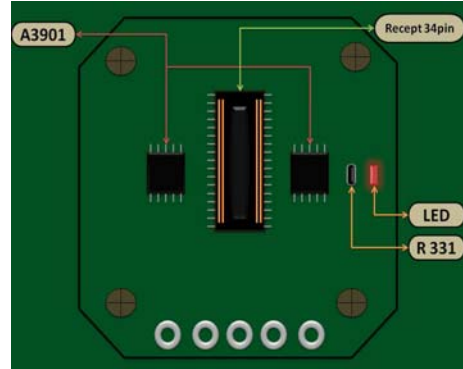

Fig. 1.bottom of midboard circuit

Fig. 2. Top of mid-board circuit

III. RADIO FREQUENCY MODULE

As you know the Robot's IR communication module has some limitations in which involve line-of-site drawback, disability to transmit data through obstacles, high intensity to fluorescent light, low distance range and some others. After IranOpen2009 contest, the MRL team worked on an alternative module based on wireless technology, that we use the *RXQ2 Radio Frequency Module* for constructing it. Fortunately we have developed this module recently and tested it successfully. We have designed this RF module as an extended board in which it can be attached on the top of Robot board.

For this purpose we have designed three modules involve:
1. *USB Wireless Data Transmitter* for transmitting data through Robots,
2. *Wireless Data Receiver Board* that can be attached on the Robots board,
3. *RXQ2 Configuration Board* for configuring the RXQ2 module.

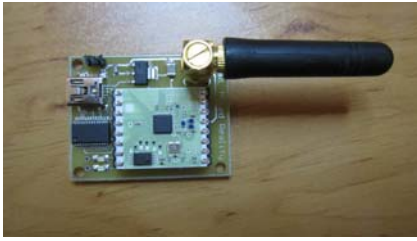
Fig. 3. Wireless Data Receiver Board

Fig. 4. Wireless Data Emitter Board

IV. ARTIFICIAL INTELLIGENCE

MRL's Artificial Intelligence team has started it work with 3 members and its goal from base was making the robots intelligent as more as possible. At the beginning, our algorithms were Static and completely depended to the environment while we got good results from them in RoboCup and Iran Open 2009. But our team did not satisfied with these algorithms and made all its efforts to change all those static algorithms to dynamic and independent from environment.

V. VISUAL OPERATOR

One of the main experiences that we gained of different competitions was the hardness of using console base operator. So in order to have a more user friendly Operator we had decided to design a new operator with a graphical user interface. In this new Operator we had designed a Button for each one of the main commands and also we kept console mode for those who would like to use console. Also we added graphical drop ball ability so by clicking at the image of the field you can drop ball to your desired position. This module had been tested successfully in RoboCup 2010.

Fig. 5. Visual Operator Module

VI. CONCLUSION & FUTURE WORKS

Both of Radio Frequency & IR have some limits. Radio Frequency is sensitive to noises and also its make noise itself. Also IR Module has limitations like line-of-site drawback, disability to transmit data through obstacles, high intensity to fluorescent light, low distance range and some others. So we have discussed more about it. We can use more powerful Radio Frequency modules and send IR from Above.

In order to make the Mixed Reality league more popular and appealing we should decrease the costs of Robots, infrastructures and maintenances. Hence, we have some suggestions for this goal:

1. Using USB cameras instead of FireWire cameras,
2. Designing new cheaper Robots,
3. Using Video Projectors instead of LCD.