Sharif Rescue Robots: Robots for Challenging Environment

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Obviously, in recent years there has been a great motivation to automate rescue procedures in order to discover more victims. Iran is a country where many earthquakes occur regularly and rescuers must face unexpected disasters efficiently. Consequently, the first solution is to use robots. The CE Dept. of Sharif University of Technology has commenced to work on this topic since 2000. The rescue workspace comprises three arenas each with its own specifications, so there is a demand for a variety of robots for each section. Magellan Pro®, Twins and EMDAD II are the robots that are used in yellow, orange and red arenas respectively. The "agents" ("intelligent robots") of this team are supervised by a central system (see Fig.1a). Each of robots searches lonely and when encounters a suspected object, an alarm is sent to the central system. In this case, depending on what is received, the central system will realize whether a victim is present or not, and the process will be kept on till the end of allowed period.

Design Strategy

- **Yellow Arena:** In this arena a commercial robot, Magellan Pro®, is used. The main challenge is to work on control software, which consists of motion planning, visual navigation and thermal detection.
- **Orange Arena:** For this arena two robots, named Twins, are considered. To establish them a four-wheeled platform has been used. An industrial PC namely Mity Mite® does the Information processing. The control software for Twins is the same as what was previously discussed for yellow arena. Twins' sensors include ultrasonic sensors, IR sensors and IR cameras.
- **Red Arena:** This arena is the most difficult of all, and it needs an all-terrain robot to be able to move around a rough land. Consequently, a special robot is designed for this section named EMDAD II. A robot of this kind must have the ability to traverse the different levels of roughness such as ramps and steps (see Fig.1.b). The hardware platform of EMDAD II, is a reliable industrial system based on industrial IBM PC104® boards. This hardware system is capable of sustaining in noisy and industrial environments. For energy supply, rechargeable Ni-Cd batteries have been used. These batteries entirely have reasonable features in comparison with other kinds of batteries.

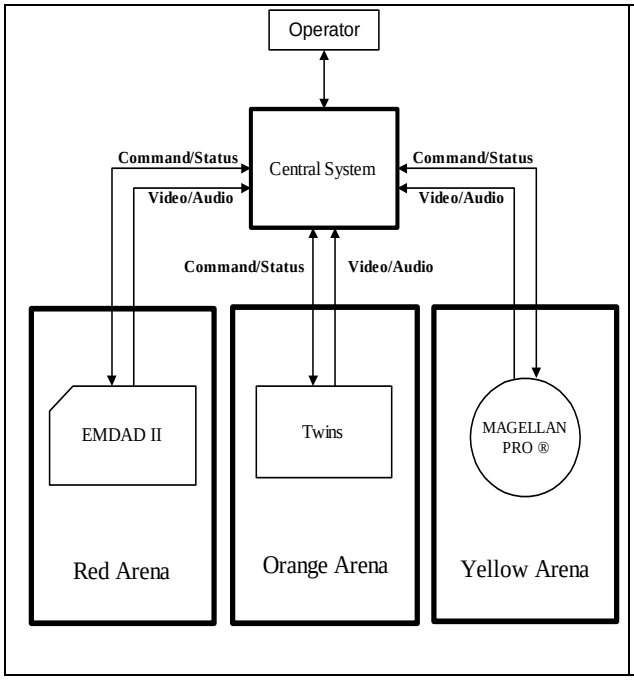

Fig.1a. Distribution of robots in each arena.

Fig.1b. Mechanical platform of EMDAD II.