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Mighty Squad IoT Based Self Organizing Approach of Multiple Robots(Swarm Robotics)

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ABSTRACT

Multi-robot systems have obvious advantages than a single robot system; Swarm robotics is a new approach to the coordination of multi-robot systems which collectively work to perform a particular task in the environment. Autonomous robot swarms represent an interesting bio-inspired concept which provides a robust and flexible system by exploiting large numbers of robots. Sometimes a single robot system is not capable to perform a specified task that task can effectively be performed by the multi-robot system. In this paper we discuss the uses of this theory in small robot applications and compare them for a small automobile prototype using a controller, to provide an output for automatically finish work without any human interaction. Here we use AI (Artificial Intelligent) and IOT (Internet of Things) concept in this proposed system.

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I. INTRODUCTION

Self-organized multi-robot systems have a lot more benefits compared to single robot systems where the coordination and cooperation with the server are more. This results in less human involvement and more precision in responses to full-fill a determined task or operation using inter-bot communication. Here server acts as an intermediary between the bots by using a self-organizing map approach. Tasks to robots are assigned without any human involvement considering a dynamic environment. Various methods are proposed to control a swarm of robots and most methods and algorithm are defined to control robots in a dynamic environment. The algorithm focuses on a binding swarm of robots to perform distributed formation control.

Server-bot communication is carried out in a two-way process which involves invoking the swarm by the server and then consecutive calls to the swarm for further robot manipulation. The detection of the load is done by loading bay which recognizes the load and sends the particular information to the server, which then acts according to the given task. The system learns from every task if the same task repeats server will send the required number of bots to carry out the task automatically. The information regarding the operations will be managed by the server into the databases the server and user can fetch the information whenever needed. The database will have fields like load id, load weight, number of bots per load, etc. and this whole information will be accessed by the administrator using his login information.

II. LITERATURE SURVEY

Farshad Arvin, John C. Murray, etal reviewed in their paper swarm robotics as an interesting concept to provide a robust robotics system by exploiting large numbers of identical robots. Swarm algorithms are mostly inspired by the social behavior of insects and other animals. The best example is given by social animals such as ants, though not very intelligent on an individual level perform tasks such as building, brood care, foraging, etc. using cooperation. In their project, they have developed a microrobot named "Colias". It uses a circular platform with a diameter of 4 cm. Long-range infrared modules with adjustable output

power allow the robot to communicate with its direct neighbors.

This concept allows the coordination of simple physical robots to cooperatively perform tasks. The autonomous and decentralized control of the swarm bots systems is achieved by describing interaction rules for individual robots.

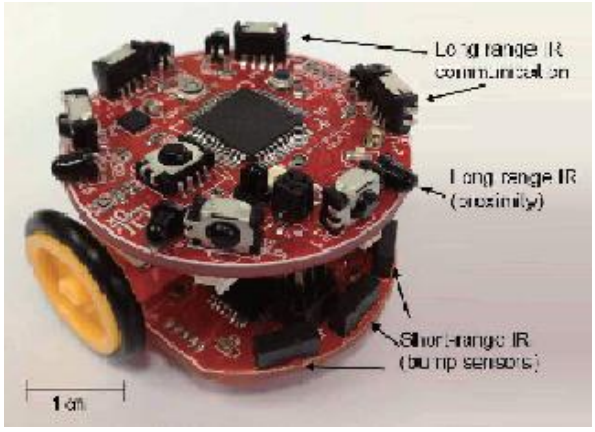


Fig 2.1 Microbot Robot

Yara Khaluf, Emi Mathews, Franz. J Rammig devised in their paper that communication between robots is an important requirement of the swarm platform. Also, modularity of the bot provides flexibility to be used in different swarm applications. Since swarm behaviors usually operate in long-term scenarios, low power consumption in the design is a must. The cooperative task always includes the concept of sharing: space sharing, time-sharing, resource sharing, etc. This sharing necessitates coordination in various aspects such as motion coordination, manipulation coordination, message exchange coordination, and others to prevent deadlocks or task failures. In their paper, they want to deploy a robotic swarm to track mobile objects in a dynamically changing environment. The swarm collectively tracks the movement of the objects and collects other information of interest about the moving object. The mobile object tracking uses wireless networks.

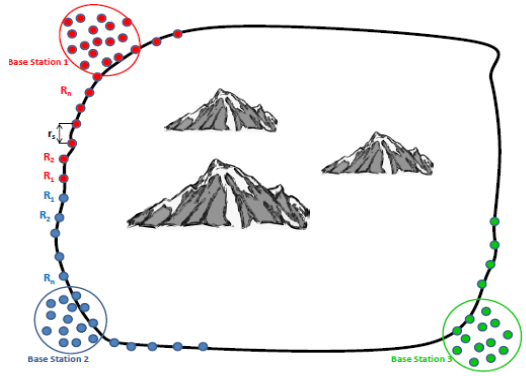


Fig:2.2 Object tracking with swarm robots

M. Brambilla, E. Ferrante. etal reviewed in their paper that swarm robotics systems have the potential advantage over more traditional approaches, to require less manual intervention because of their robustness, scalability, and flexibility. Although these three characteristics might reduce the need for maintenance, this might be true only up to a given extent. Further studies are necessary to understand when and how to perform maintenance on a swarm robotics system. It is necessary to study if different collective behaviors need different maintenance approaches. Our project is about coordination amongst the bots to displace a particular object to its destination. Coordination is a tricky subject for multi-agents.

Whether the agents are distributed or centralized is one of the decisions to be made. Now, distributed means the agents are mainly governing themselves whereas centralized means there is a leader that is giving orders or making plans for the other agents.

In this project, the centralized mode is used since the ESP module is the main governing body to which the microbots are going to respond. This is a design of a new low cost and open platform microrobot to be used in swarm robotic researches. Experiments will be performed on hardware components such as communication and sensory systems.

III.PROPOSED SYSTEM

Extensive work has been done based on swarm studies producing a number of models and corresponding applications intended to solve problems such as routing of goods in a production company for shifting the goods from one location to another. In our proposed system, we have developed bots which are able to push the object and transfer it from one location to another intended location. If the object is too heavy one bot is not capable to transfer that object from its source to intended destination then system will automatically activate another bot in the network and then both the bots will collaboratively work and shift that object from one location to intended location. Also, we segregate the object base on RFID tags. We have proposed a system to reduce the human interaction in industrial areas, warehouses and do work with more efficiently and with great ease.

IV. METHODOLOGY

In the proposed system, the ultrasonic sensor is used to detect the object in front of the bot. If the object presence gets recognized then the bot will activate and start doing the work of transferring an object from one location to another. The object motion is recognized at

detector 1 and destination detector 2. When the object is recognized at destination detector 2 it means that an object is reached at the intended position, the bots will get reversed and return back to its initial position. If the object doesn't pass through the detector in the specified time bound it means that single bot is not capable to push the object. Then sever automatically activate the second bot in the network then both bots will collaboratively work to push the object and transfer to the destination and same after object reached a destination server detect the object at the destination point and instruct both bots to reverse back at its initial position. Meanwhile, RFID Reader reads the tag attached on the object and display number on display board, it helps us in work of object segregation.

V. BLOCK DIAGRAM

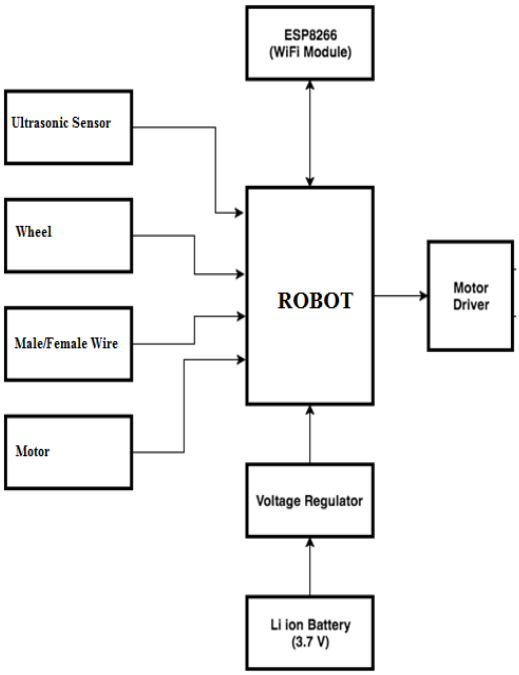
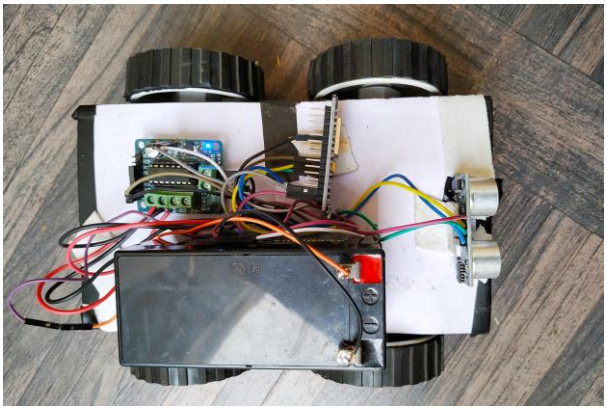
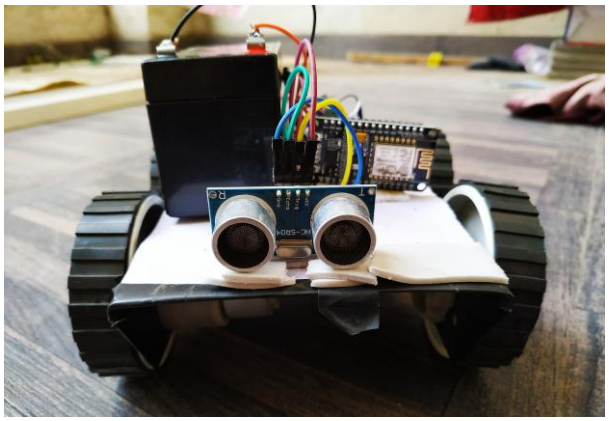
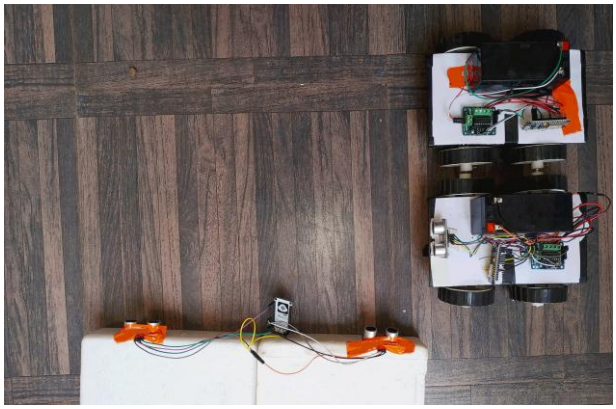


Fig: 3.1 block diagram

VI. RESULT







VII. CONCLUSION

An experiment was performed on hardware components such as communication and sensory systems. We presented the design of a new low cost and open platform microrobot to be used in warehouses. The system will remove the inclusion of human intervention. The system will function autonomously when it detects a load and the robots will perform their related tasks.

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