Cooperative Control in Swarm Robotics Via Server

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ABSTRACT
Swarm robots are a new approach in the robotic system. This idea of Swarm Robots is designed from the idea of small insects. Swarm robots can work co-ordinately and achieve its common goal. Self-organizing map (SOM)-based on the multi robots that have self-organizing criteria,Co-ordination and that can also be approached for dynamic environment. It can control number of robots and achieves different task locations randomly and gets its initial locations and directions.

Keywords
Co-operative control, Wi-Fi bot, Swarm Robotics, Swarm Intelligence, Computational Swarm Intelligence.

1. INTRODUCTION
Swarm robotics is becoming extremely interesting topic for multirobots researchers. The algorithm of swarm is mostly inspired by social behaviour of small animal and insects.Swarm robot is a concept of providing a robotics system by exploding large number of identical robots. The task is to design methods for enabling group of robots in the real world. Motion planning is considered to this kinds of robots. Efficiency and effectiveness is done by doing some studies. Swarm robots can fetch the given task by grouping together and completing the task. In this, robots have the task assignment and thus start when the tasks are given. These kinds of robots can achieve different task locations. The robots are cooperative to their task.

They have good interactions between them so that they can complete their given task. Due to their wireless property its connectivity range can extend, this can be the advantage of robots. The main aim of this study is to have

1.Co-operative control over the robots,

2.Efficient-working[12],

3.Self-organized[10],

4. Decision-making[4],

5. Task scheduling[12],

6. Co-ordination[18].

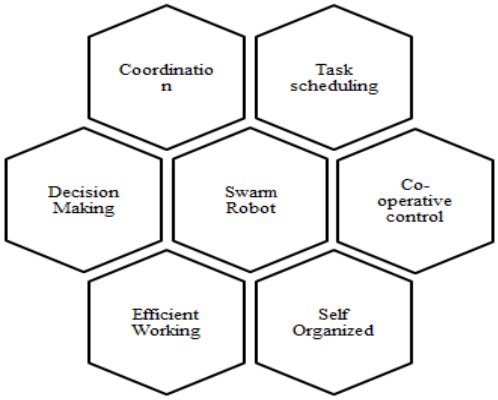


Fig 1. Main Aim.

Different task are divided to each of the bots and the targeted task is completed accordingly. So now it became easy to use these capabilities to locate the target. In this paper, we are creating small robots (bots) so that they can track down the target even in complex situations using ultrasonic sensors and can distribute its given task among the robots if the following robot is not capable of doing the task-alone

2. ARCHITECTURE

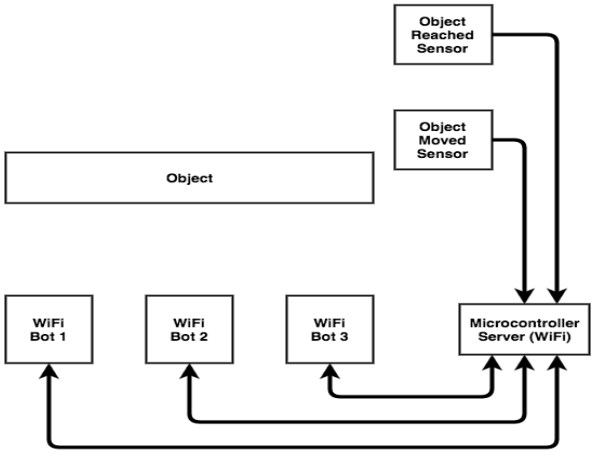


Fig2: Architecture

There are three bots constructed as shown in Fig2. Microcontroller server (Wifi) is connected with these bots. The bots have ultrasonic sensors so that it can track down the object.

3. WORKING

As robotics is growing in this age, scientists continue to take some sort of information from the natural world, And now, those scientists are learning to use swarm intelligence to create robots. The main aim of this project is to study swarm robotics. Analyse its different parameters and focus on reducing the cost of design. Our initial aim is to design the autonomous robots. It means that if one robot is not able to push the object, it will communicate with the second robot and so on till the object reaches its destination.

4. FLOWCHART

USE OF HARDWARE AND SOFTWARE

4.1 ESP8266 Wi-Fi Parameter:

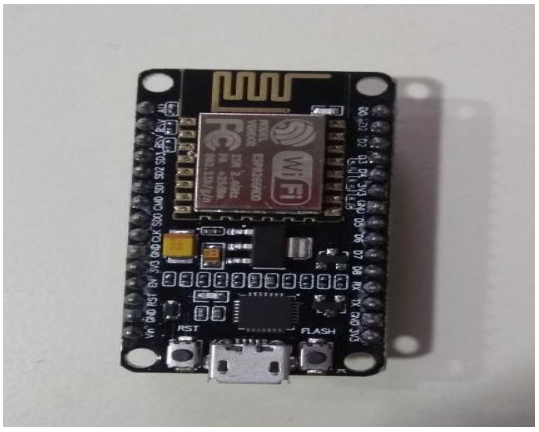


Fig 4: ESP2866 wifi parameter

- Wi-Fi protocols:802.11 b/g/n
- Frequency range:2.4G to 2.5G(2400M to 2483.5M) Hardware Parameters:
- Peripheral Bus: UART/SDIO/SPI/I2C/I2S/IR remote control
- Operating voltage: 3.0 to 3.6 V Software Parameters:
- WIFI mode: Station/softAP/softAP+Station
- Network Protocols: IPv4,TCP/UDP/HTTP/FTP

4.2 ATMEGA328

- Two 8 bit counter/timer .
- Real Time counter with separate oscillators.
- 6 PWM channels.
- 8 channel 10 bit ADC in TQFP package.
- Serial USART.
- On chip analog comparator.

4.3 Ultrasonic sensors

Fig 5: Ultrasonic sensors

INFRARED RECEIVER

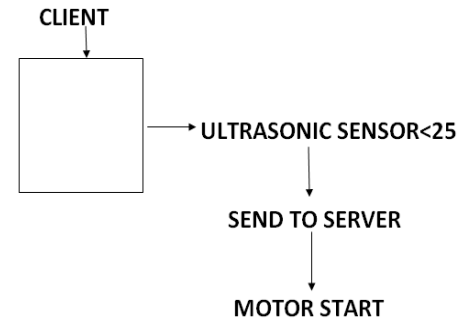
- Quick acknowledgement time.
- Photo delicacy.
- Small juncture holding capacity.
- Operating temperature range: -40 to +85.

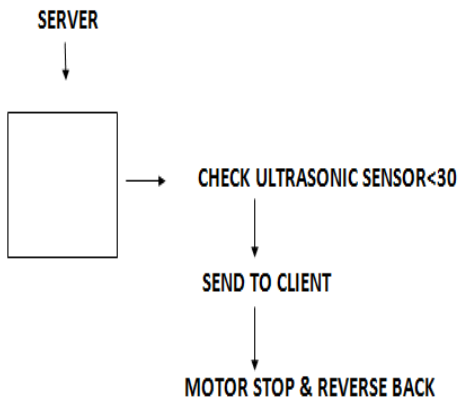
INFRARED TRANSMITTER

- High reliability.
- High radiant intensity.
- 2.54mm LED spacing.
- Low forward voltage.

5. CALCULATIONS

5.1 Hardware Design






```
ALGORITHM:   for ( i=0, i <= max, i++)
             {
               send value to ith number of client
               send response
             }
```

6. OBSERVATIONS

The client (bots) move according to the messages sent from server to the client

(bots) and visversa.

Case 1:

As the client(bot1) sense the object that is to be pushed to its destination,

within its 25cm of area it moves towards the object

and try to push it, when its able to push the object to its destination the work of the client is completed.

Case 2:

- If the client1(bot1) is not able to push the object the server sends the message to the client2(bot2) so as to push the object, along with client1.

Case 3:

If even the client2(bot2) is not able to push the object the server sends

message to the client3(bot3) to push the object along with client1,client2.

And hence, the pushing of object from its source to destination is done.

7. RESULTS

7.1 Hardware Results:

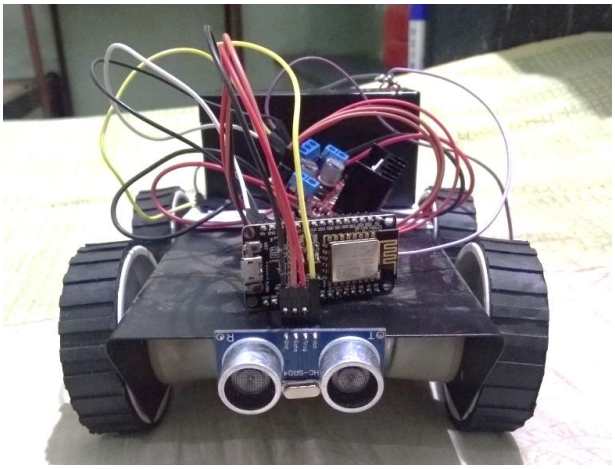


Fig 6: Front View(bot)

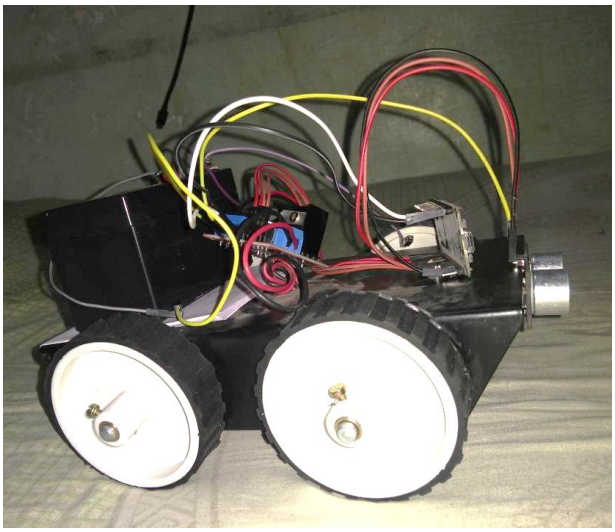


Fig 7: Side view(bot)

8. CONCLUSION

We have presented swarm based approach in cooperative control using server. The bots have to monitor the environment during specific time slots. Control and coordination is done by using swarm robotics. Can be able to use in military service for locating objects, automobile, mechanical fields etc. Self assembly of the robots are done as so it can coordinate with other bots and can provide stability to move the bots in unstructured terrain. Collectively transportation can be done by using bots.

9. ACKNOWNLEGEMENT

It gives us great pleasure presenting the project paper on 'COOPERATIVE CONTROL IN SWARM ROBOTICS VIA SERVER'. We would like to take this opportunity to thank our guide Prof. Bhushan Thakare for giving us all the help and guidance we needed.

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