

## Implementation of Dual Swarm Bot Using NRF Module

Someshvar S, Srivatsa K, Suhas H, T Chandramouli,  
Prof. Anupama R

School of ECE REVA UNIVERSITY

### ABSTRACT

*The robots science has been developed over the past few years, where robots have become used to accomplish difficult, repetitive or accurate tasks, which are very hard for humans to carry out. In this paper, we propose a method to control the motion of a swarm of robots and make them able to avoid obstacles. The proposed solution is based on master slave concept, where the slaves follow the actions of the master, The project includes detection of toxic gases, detection of humans movement and recording of videos using smartphone camera. Therefore, This work can have various applications like military etc.*

**Keywords:** *Swarm robotics, Cooperative control, Simulation intelligence, swarm intelligence*

### I. INTRODUCTION

Swarm-bots are a collection of mobile robots able to self assemble and to self organize in order to solve problems that cannot be solved by a single robot. These robots combine the power of swarm intelligence. Due to heavy duties or sometimes very accurate duties (duties performed in very narrow areas), human being cannot perform those tasks and it becomes very important to use robots. With the revolution of technology and the expanding of discoveries and science, the human's passion to know far things as in seas or in space is increasing. Also, humans want to reach undiscovered locations and difficult to reach places. This made robots become one of those possible potential solutions. Robots are pre-programmed or controlled and can carry out tedious, boring or dangerous tasks, and also able to do the needed works accurately. In addition, robots might involve in searching for survivors and rescue during natural disasters and wars. Other robots might be used to carry out surgery tasks or household works. The robot's work might vary from simple to complex task. Fortunately, robots have begun working in these places, where most of them have the ability to which flies without a pilot, submarine or mobile robot., Further this project is carried out using pir sensor which is used to detect human movement ,and toxic gas sensors to determine the poisonous gases which is mainly used in military applications,A smart phone camera is used in the robot to capture videos and images of the location.

### II. RELATED WORK

Through research of a bunch of IEEE papers and a few other articles makes it evident Swarm robot system has a great potential in robotics research and it is used in industrial applications.

2.1 [JC Barca, YA Sekercioglu](#) - Robotica, 2013 - cambridge.org

We present a review of recent activities in swarm robotic research, and analyse existing literature in the field to determine how to get closer to a practical swarm robotic system for real world application

2.2 [O Soysal, E Sahin](#) - Proceedings 2005 IEEE Swarm ..., 2005 - ieeexplore.ieee.org

In this study, a systematic analysis of probabilistic aggregation strategies in swarm robotic systems is presented.

generic aggregation behavior is proposed as a combination of four basic behaviors: obstacle avoidance, approach, repel, and wait.

2.3 L Bayindir - Neurocomputing, 2016 – Elsevier

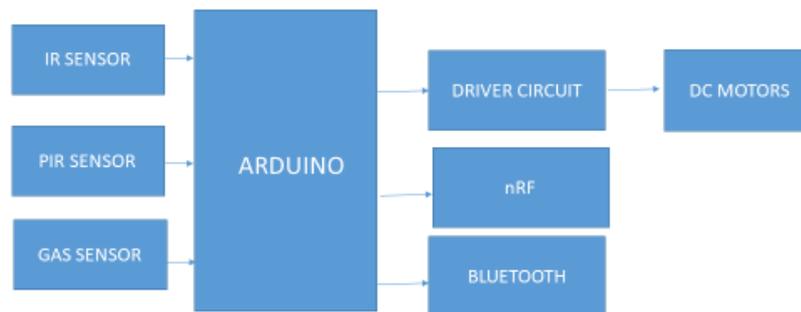
Swarm intelligence principles have been widely studied and applied to a number of different tasks where a group of autonomous robots is used to solve a problem with a distributed approach, ie without central coordination.

### III. PROPOSED WORK

#### 3.1 Working of Block Diagram

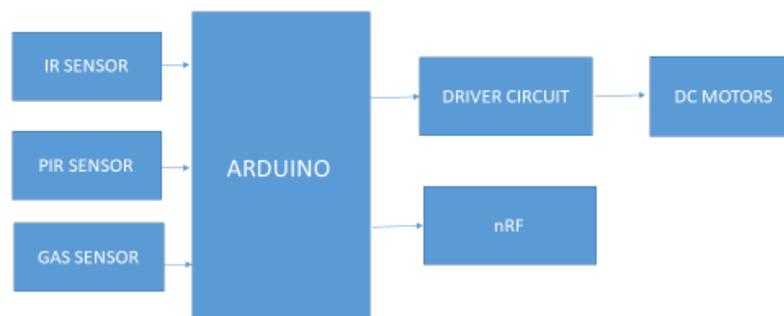
##### Block diagram

###### • MASTER



##### Block diagram

###### • SLAVE



- Here the master is given commands through Bluetooth module such as forward, reverse, left and right.
- The command is then forwarded to the slave through nRF module.
- The slave follows the steps performed by the master.
- The sensor data from the slave to master which in turn is sent to the user through Bluetooth.
- Further this project is carried out using pir sensor which is used to detect human movement, and toxic gas sensors to determine the poisonous gases which is mainly used in military applications
- A smart phone camera is used in the robot to capture videos and images of the location

#### IV. Working of components

The five main blocks of a swarm project consist of

##### A) Arduino Master & Slave:

The master and slave are two Arduino-based bots, which cooperate together to carry out the desired task - in our case transportation of heavy objects. The master controls the movement and actions of the slave.

##### B) RF Module (nrf24l01):

The communication between the master and the slave takes place through the RF module. The Master sends the desired command through the transmitter module, which is received and followed by the Slave through the receiver module attached to it.

##### C) Obstacle Avoider:

This is the eye of the bots. Obstacle avoider helps the bots to avoid unwanted obstacles and also prevents collision against each other. It comprises of a system of photodiodes and LEDs, which are placed on the master and the slave respectively

##### d) Passive Infrared Sensor (PIR)

The term PIR is the short form of the Passive Infra Red. The term "passive" indicates that the sensor does not actively take part in the process, which means, it does not emit the referred IR signals itself, rather passively detects the infrared radiations coming from the human body in the surrounding area.

##### E) IR Sensor

An infrared sensor circuit is one of the basic and popular sensor modules in an [electronic device](#). This sensor is analogous to human's visionary senses, which can be used to detect obstacles and it is one of the common applications in real time. This circuit comprises of the following components

##### F) Gas sensors

A GAS sensor or a GAS Detector is a type of chemical sensor which detects/measures the concentration of gas in its vicinity. Gas sensor interacts with a gas to measure its concentration. They are used in various industries ranging from medicine to aerospace. Various technologies are used to measure Gas concentration such as semiconductors, oxidation, catalytic, infrared, etc

##### G) Motor driver circuit

The L293 is an integrated circuit motor driver that can be used for simultaneous, bi-directional control of two [small](#) motors.

#### H)HC- 05 module

HC- 05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication

### V. HARDWARE AND SOFTWARE REQUIREMENTS

Table:4.1

HARDWARE REQUIREMENT	SOFTWARE REQUIREMENT
<ol style="list-style-type: none"><li>1. Arduino uno</li><li>2. Bluetooth module</li><li>3. Nrf module</li><li>4. Toxic gas sensors</li><li>5. PIR sensors</li><li>6. IR sensors</li><li>7. Driver circuits</li><li>8. Battery</li><li>9. DC motors</li><li>10. Robot chassis kit</li></ol>	<ol style="list-style-type: none"><li>1. Embedded C</li><li>2. Arduino Ide</li><li>3. Blue term application</li></ol>

### VI. CONCLUSION

In this paper, we propose a computational trajectory generation algorithm for swarm mobile robots using local information in a dynamic environment. The algorithm plans a reference path based on constrained convex nonlinear optimization which avoids both static and dynamic obstacles. This algorithm is combined with one-step-ahead predictive control for a swarm of mobile robots to track the generated paths and reach the goals without collision. The numerical simulations and experimental results demonstrate the effectiveness of the proposed free-collision path planning algorithm.

Further this project is carried out using pir sensor which is used to detect human movement ,and toxic gas sensors to determine the poisonous gases which is mainly used in military applications, A smart phone camera is used in the robot to capture videos and images of the location

### REFERENCES

- [1]Cheng, K., Y. Wang, and P. Dasgupta (2009). Distributed area coverage using robot flocks, in Nature & Biologically Inspired Computing, NaBIC 2009. Défago, X. and A. Konagaya (2002).
- [2]Circle formation for oblivious anonymous mobile robots with no common sense of orientation, in Proceedings of the second ACM international workshop on Principles of mobile computing. Ducatelle, F., Di Caro, G. A., Pinciroli, C., Mondada, F., & Gambardella, L. (2011).
- [3]Communication assisted navigation in robotic swarms: self-organization and cooperation, in proceedings of international conference on Intelligent Robots and Systems (IROS). Folino, G. and G. Spezzano (2002).

An adaptive flocking algorithm for spatial clustering, in Parallel Problem Solving from Nature—PPSN VII. 2002, Springer. p. 924-933.

[4].An adaptive flocking algorithm for spatial clustering, in Parallel Problem Solving from Nature—PPSN VII. 2002, Springer. p. 924-933.

SWARM-BOT: Pattern formation in a swarm of self-assembling mobile robots. In: Proceedings of the IEEE International Conference on Systems, Man and Cybernetics. IEEE Press, Piscataway (2002).