

# Mr. Bot—A Survey on Arduino-Based Autonomous Robotic Vehicle



J. Karthiyayini, Chayanika Biswas, C. C. V. N. Ashish, N. B. Hrishikesh, and A. Ayesha Siddiqua

**Abstract** Robots have a rising contribution in real-world settings, such as schools, homes, hospitals, laboratories and workplaces. With the fast-moving world we like everything automated which is increasing the development of autonomous systems to perform both minor and major tasks which would save our time and effort. Mr. Bot acts as a helping hand and tries to reduce the human effort and is the first step in the involvement of robots in daily use. Mr. Bot is a robotic vehicle that has the capability to reach a particular destination to deliver small items and/or convey messages. Mr. Bot has sufficient intelligence (Joshi G, Kolhe P Intelligence spy robot with wireless night vision camera using wi-fi) to follow the shortest path in the provided space and detect the obstacles in both day and night visions (Manasa P, Harsha KS, Deepak DM, Karthik R, Nichal NO Night vision patrolling robot). Mr. Bot acts as helper, it can be summoned to any required place, and it can be sent to any destination to deliver small objects (such as cables, papers and books) and conveys messages via LCD.

**Keywords** Robot · Autonomous system · Intelligence · LCD

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# 1 Introduction

The origin of robot's marks to the ancient world. The concept of robots came into existence as early as 3000 BC, and they were certain mechanical devices which would carry out particular functions involving physical tasks as per the instructions. The early built-in mechanical devices were Egyptian water clocks to hit the hour bells, wooden pigeon (400 BC) developed by Archytus of Tarentum could fly, hydraulically operated statues (second century BC) built in Hellenic Egypt could speak and show gestures, Petronius Arbiter made a doll (first century AD) that could move, and Giovanni Torriani developed a wooden robot (1557) that could fetch bread from the store, talking doll (nineteenth century) by Edison and steam-powered robot (nineteenth century) by Canadians. These inventions and discoveries were the seeds of inspiration in the field of robotics, then in the twentieth century the field of robotics took a huge leap and surpassed all the previous inventions. The recent inventions of robots include AMECA which has the capability of face and multiple voice recognitions, ARMAR-6 has the capability of moving objects and handing them to the desired person, DIGIT has fully functional limbs, JIAJIA can express certain emotions such as laugh and cry, SOPHIA can process visual, emotional and conversational data for better interaction with human beings, and many more to go.

The term robot has several definitions but all of them come down to the same concept of "a reprogrammable, multifunctional, manipulator device" that is designed intelligently to perform certain physical tasks such as moving materials, tools and delivering objects through various programmed motions for completion of the tasks. The word "Robotics" was penned by Russian born American Science fiction writer Isaac Asimov in his short story "Runabout" in the year 1942.

Asimov proposed three laws of robotics which are being followed till date, and those are:

1. A robot must not injure living beings via any form.
2. A robot must obey its master's commands except where it would disagree with the first law.
3. A robot must defend its own existence as long as it would not disagree with the first and second law.

The world of robotics has taken a huge leap from just being certain mechanical devices to the development of humanoid robots. Robots in today's world are very well developed and assist human beings in their day-to-day life in various fields such as hospitals, education and health care.

Our concept of Mr. Bot has a better improvised version from the early-century robots but less features compared to our current-day humanoid robot it tries to inculcate a lot of features such as detecting the obstacles, live streaming its path and can also capture and store them, read characters, it can be controlled by voice and respond to it, and it can be summoned via mobile.

## 2 Literature Survey

Arduino Based Voice Controlled Vehicle [1] by M Saravanan, Anandhu Jayan, B Selvababu, Aswin Raj and Angith Anand proposes the idea of controlling the robot via voice commands using mobile applications (mobile app). The robot has higher accuracy in voice recognition and is highly sensitive to surrounding noise, but the voice commands must be provided via the Android app.

Review on Optical Character Recognition [2] by Muna Ahmed Awel and Ali Imam Abidi proposes the idea of a robot which uses different approaches of character recognition system accuracy to understand the alphabets with higher accuracy, but it can only detect English, Arabic and Devanagiri characters.

Robot Voice—A Voice Controlled Robot Using Arduino [3] by Vineeth Teeda, K Sujatha and Rakesh Mutukuru proposes the idea of controlling the movement of robot using voice commands, and these voice signals are captured using inbuilt microphone. The robot takes voice commands, executes them and gives acknowledgment through speech output, but the impact of the distance between the mouth and microphone on the robot affects the performance of the robot, and it also impacts on the speech to text conversion.

Moving Obstacle Avoidance of a Mobile Robot Using a Single Camera [4] by Jeongdae Kim and Yongtae Do proposes the idea of robot which detects the object using single camera and tries to find a proper path, but it fails when the distance between objects is more, if the object's color is similar to the surroundings and too much reflection of light.

Optical Character Recognition based Auto Navigation of Robot by Reading Signboard [5] by Prof. Suneel K Nagavi, Mahesh S Gothe and Prof. Praveen S Totiger proposes the idea of a robot that reads characters and symbol and carries out navigation process using those characters and symbol. It permits a robot to find path consequently by distinguishing and reading textual information in signs located (sign board) by utilizing OCR, but it is standardized by using black color with character size from 34–48 and written in Ariel style.

An Abstraction Layer Exploiting Voice Assistant Technologies for Effective Human–Robot Interaction [6] by Ruben Alonso, Diego Reforgiato Recupero and Emanuele Concas proposes the idea of robot that uses voice assistant to convey messages directly to the user. It provides an effective communication between the robot and the user, but the language and pronunciation of certain words might create confusions and lead to different search results.

Night Vision Patrolling Robot [7] by Poojari Manasa, Deepak D M, K Sri Harsha, Karthik R and Naveen Nichal O proposes the idea of robot that uses the night vision camera to work in both day and night light and find a suitable path, but it can only be controlled by sound sensor and not by manually or by Wi-Fi.

Development of an Arduino—Based Obstacle Avoidance Robotic System for an Unmanned Vehicle [8] by Kolapo Sulaimon Alli, Moses Olluwafemi Onibonoje, Akinola S Oluwole, Michael Adegoke Ogunlade, Anthony C Mmonyi, Oladimeji Ayamolowo and Samuel Olushola Dada proposes the idea of a robot that detects the

objects using IR sensors, and it can also be controlled utilizing an IR sensor and a remote controlled device, but the robot cannot detect the long distance objects as it is using IR sensors.

### 3 Objectives

- To develop a robot which has both manual control and automatic control to deliver small objects and/or convey messages from one place to another. The robot is always stationed at specific point and can be summoned in front of any room in its path and can be sent to any other room to deliver objects or conveys messages; after the work has been completed the robot returns back to its station.
- In order to do this task successfully the robot has to perform various operations such as obstacle detection [8], path detection, night vision [9] and character reading [2].
- Mr. Bot detects the path using path and obstacle detection mechanism by following the specified path marked on the floor by connecting all the rooms; when an obstacle is encountered it tries to avoid the obstacle if possible, else takes a different path, if a different path is not available it alerts with a buzzing sound, and it also reads the unique labels marked in front of each room using character [10] reading to reach its destination.
- Night vision [7] enables the robot to perform obstacle detection and path detection in absence of light.

### 4 Existing System

In the existing project, we will find robots that implement only a specific feature instead of implementing as a whole with multiple features. Our project, Mr. Bot, tries to sum up the existing project, add few additional features and create a single multifunctional bot.

### 5 Proposed System

Mr. Bot is a mini robot that is developed to perform minor tasks. Mr. Bot can assist human beings in their day-to-day life in various fields such as hospitals, schools and colleges. Mr. Bot has both manual control and automatic control to deliver small objects or convey messages by performing various operations inculcating a lot of features such as detecting the obstacles [8], live streaming its path and can also capture and store them and read characters [5, 10], and it can be controlled by voice and respond accordingly and can be summoned via mobile.

## 6 Proposed Methodology

Our suggested robot would follow simple commands provided via the mobile app [1] or voice commands, and with better future enhancements it can be used to perform tedious tasks.

**The Major features are listed below:**

**Obstacle Detection [4]:** It is achieved using IR [8] sensors and ultrasonic sensors [11] to detect the object size and decide whether it can pass over it or take a diversion and find a new path, and if it is not able to find a new path then it will stop and alert with a buzzing sound.

**Character Recognition [5, 10]:** The robot uses camera [5, 9] to read the characters and/or numbers to reach its destination.

**Night Vision Camera [7]:** It is designed using night vision camera which uses infrared light to detect path and obstacles in the night vision [7] where there is no sufficient lighting condition.

**Voice Control [1, 3]:** It is achieved using microphone to interact with the robot, where we can directly give commands to the bot instead of using the mobile app [1]. The bot not only accepts the command, but also responds to it with certain short messages.

**LCD Screen:** It displays the message that has to be conveyed to the desired person.

**Mobile App to Monitor [2]:** An app is developed to give commands to the robot. It is basically used to summon it, give instructions to it, type a message that needs to be conveyed and provide a path to it. The app also helps us to control the movement of the robot.

The diagram displays the basic working of the bot. Mr. Bot is initially in its idle state, stationed at a particular place; when it is summoned it reaches the desired place and alerts. The user can add any message to be conveyed or place any object that needs to be delivered; these instructions can be provided via voice command or app, and then the bot will be sent to the destination; after completion of the task, the bot goes back to its station.

## 7 Applications

- **Schools, Colleges and Universities:** The bot can be used to collect the attendance sheet from every classroom, call the teachers for the meetings, etc.
- **Hospitals:** To deliver the medicines to the required patient and guide any person to reach a particular destination such as pharmacy, emergency ward and laboratories.
- **Shopping mall:** Helps the customer to find any required object and can be used like a cart to carry small objects.

## 8 Expected Result

- A fully functional robot which can be used to deliver small objects and convey messages using a LCD screen, from the summoned point to the required destination.
- Detects and tries to avoid obstacles if possible, else alarms everyone about the obstacles.
- Performs character reading to identify room numbers which are marked on its path.
- The robot is enabled with night vision [12] to perform the tasks smoothly in absence of light.
- Mr. Bot can be summoned in front of any room in its path from its original station and can be sent to any other room its path, after which it will return to its original station.
- Mr. Bot can be controlled manually or can be automated, and certain voice commands are understood by the robot and responds accordingly.

## 9 Conclusion

Mr. Bot is a robotic vehicle that acts as a helper and can be used in schools, colleges and hospitals. Mr. Bot can be used to deliver small objects and display message via its LCD screen. It is always stationed at a particular place and can be summoned via mobile; it can be sent to any other place on its path to complete our desired task. With better future enhancements it can replace peons in any institutions and not only be limited to one floor.

## 10 Future Enhancements

- The robot can move freely without a specific path on the ground.
- AI technology for face and object recognition to identify the required person and the objects that are being delivered.
- Security surveillance feature [13] can be added for night safety.
- Complete speech recognition and voice control for performing all tasks.
- Movement between multiple floors by using lift or stairs ( Figs. 1 and 2).

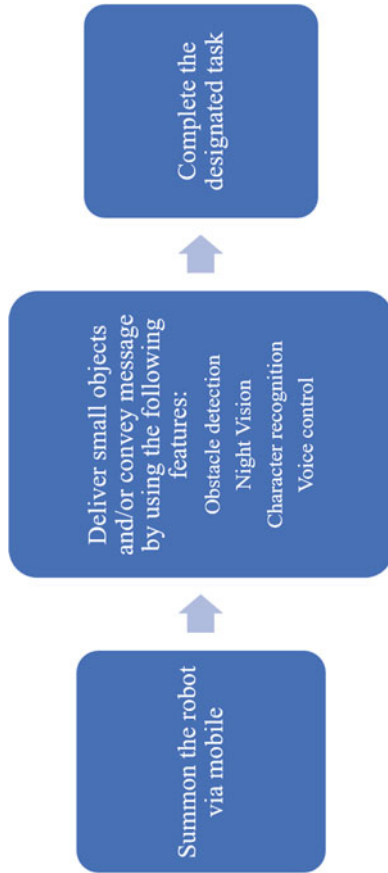


Fig. 1 System architecture

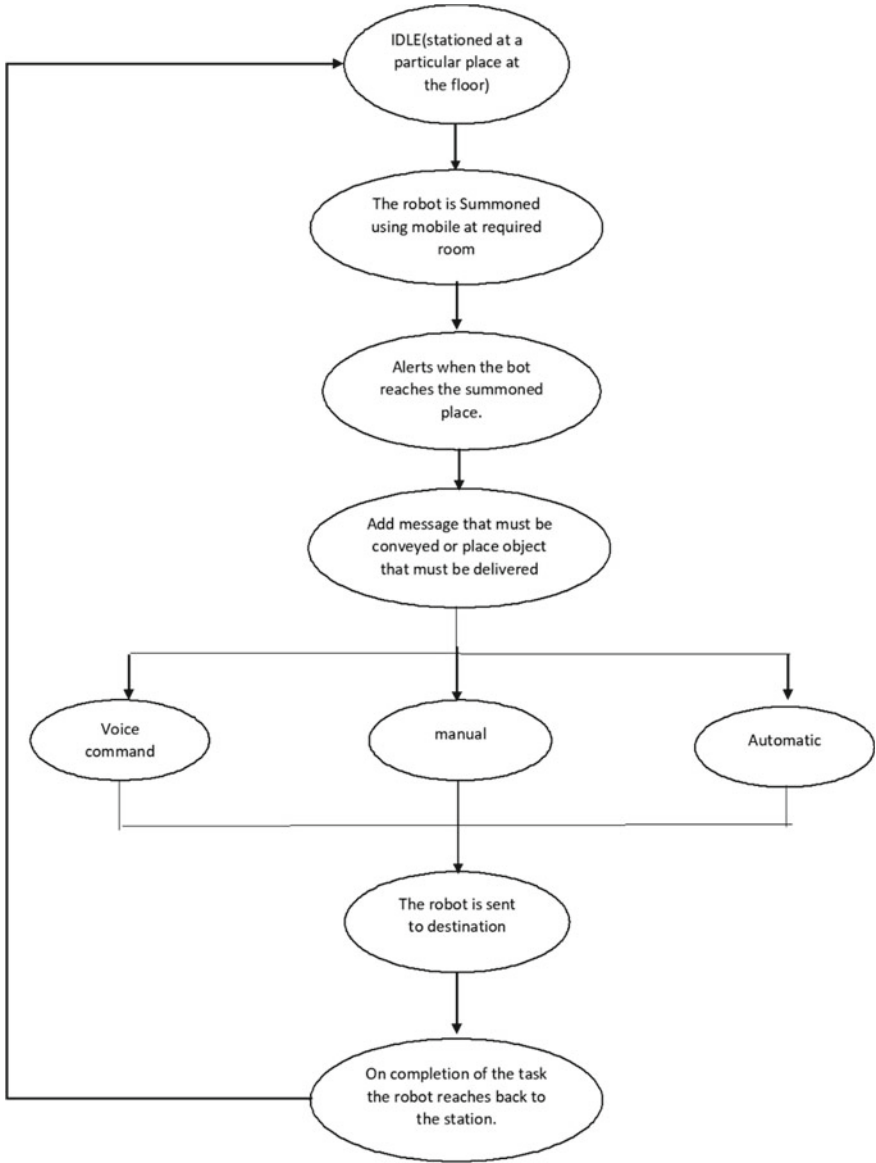


Fig. 6.2 Flow diagram



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