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Sensor Based Motion Control of Mobile Car Robot

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ABSTRACT

A robot is a computer-, mobile-, or digital-programmed virtual synthetic agent or electromechanical system that can perform tasks on its own. These frameworks stand out because of their ability to be controlled. As a result of this, a group of independent PCs appears to clients as a single controlling framework. Artificial Intelligence (AI) is required to construct technologies that can interact with the physical world in Robotics and Vision. AI systems such as robots can only communicate with the real world if they do their tasks accurately. The Robot's efficiency is highly dependent on the application's vision techniques. As a result, the development of self-driving and self-contained robots relies heavily on visual techniques and procedures. A combination of temperature, gas, and fire sensors, as well as a buzzer, is used to detect areas that are more prone to explosions. In addition, a live video feed is available to keep tabs on the car's every move. Sensor-based remote control of mobile robots in an unknown environment with obstacles is the focus of this paper.

KEYWORDS: *Robot, IoT, Sensor, Motion, AI, Autonomous, Motion control, Mobile Car*

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INTRODUCTION

Robots are being created that can work in a wide range of environments and for extended periods of time without the need for human supervision. These are tasks that are difficult or risky, or that take place in a hostile environment. Service robots, surveillance, and exploration are all examples of applications where autonomous navigation systems are employed to both move and carry out the primary mission at the same time. A mobile robot's primary function is to navigate, and without it, nothing else can be performed. [1] There are many methods to describe navigation, but the ultimate result is the same: it creates operating systems that allow the robot to reach its distant destination regardless of the circumstances it may face.

In a motion planning strategy, the movement is pre-planned and hence "fixed" before it is really carried out. A representation of the surroundings and the robot is used to guide the planning process. Powerful ability to identify answers in exceedingly complicated contexts is one of its most well-known advantages. Displacement might be restricted geometrically or be topologically complicated. [2]

The robot's navigation control is realised by fuzzy coordination of all the rules. Inputs to the fuzzy controller include range and target location signals that have been sensed or calculated.. An intelligent mobile robot is being guided by real-time fuzzy reactive control in new and changing settings. [3] According to the numerous scenarios specified by instant mobile robot motion, the environment, and target information, a reactive rule foundation is synthesised.

Mobile robot locomotion is the first problem that affects them. Despite the fact that most of their time is spent in well-known, safe places like factories and shopping malls,[4] they are occasionally forced to walk across hostile, hostile, and harsh terrain. An significant part of the design of a mobile robot's locomotion system includes considerations such as manoeuvrability, controllability, terrain conditions, efficiency and stability, as well as other technical criteria such as a robot's ability to traverse a wide

range of terrains. [5] Robots can primarily walk, roll, jump, run, slide, skate, swim, and fly, depending on the robot's design and the environment. Mobile robots can be divided into several groups based on the way they move.

- Stationary (arm/manipulator)
- Land-based
- Wheeled mobile robot (WMR)
- Walking (or legged) mobile robot
- Tracked slip/skid locomotion
- Hybrid
- Air-based
- Water-based
- Other

Review of Literature

A Bluetooth-enabled mechanical car is proposed, and it then delivers a point-by-point comparison of various sensors used in autonomous driving. In addition to a Bluetooth module, a mechanical knock sensor is attached to the car's facade to detect if the vehicle has been hit and, if so, the exact time of the collision. [6]

Following a black line path while incorporating other characteristics such as collision detection and avoidance or the capacity to fall from a particular height with great stability and control is the goal of this research. A central Arduino UNO microcontroller interfaces with IR sensors, Bluetooth, and Wi-Fi components in the design. Connected to the used end through long-range Wi-Fi, a user can adjust a robot car's direction by altering its position. [7]

Consequences including local trap situations, erratic and oscillating movements, or the inability to drive towards locations with a high obstacle density or far from their intended direction were identified by Minguez and Montano (2004)[8]. These characteristics become increasingly important in the creation of robust apps that can be used in any setting, regardless of how challenging the terrain is. As a result, the usage of reactive navigation systems in real-world applications is limited.

In this study, various sensors are used to construct a mine detection robot. An ultrasonic sensor, gas sensor, temperature sensor, and humidity sensor are all employed in the detecting process. The device is designed to aid the military in areas where detection of mines is very likely. In addition, when a mine is detected, an alert is delivered to a smartphone via IOT and a camera is attached to the intended car for video surveillance. Thus, the robot saves the lives of soldiers on the front lines by substituting for them wherever possible. [9]

Objectives

- Define sensor based mobile robots.
- To explain the evolution from automated guided vehicles to autonomous mobile robots.
- Identify the technological advances affecting the planning and control decisions.
- To provide guidance and methods to plan and control autonomous mobile robots.
- To Study different types of robot sense
- To overview of SPOT

Research Methodology

There are several reports that are reviewed and analysed in this study regarding the issues. The journals were sourced from online databases, with a particular focus on journals. On the subject of identification, the attention was on the study's material, participants, and learning methods. Classification accuracy and items, methods, and results were the primary criteria for identifying research publications. This data was then used to compile an exhaustive overview of previous studies and research on the subject matter.

Result and Discussion

Sensors have recently become more inexpensive and lightweight thanks to recent breakthroughs in bio-inspired measuring technologies, making them easier to utilise on robots. Some examples of these sensors are RGB-D cameras, tactile skins, pressure transducers, and so on (see Fig 1). [10]

Distance | Vision

Fig 1 Types of Robot Senses

The robot's sensors will detect an impediment as it goes towards its destination, requiring it to use an avoidance method to avoid it. It's critical to strike a balance between avoiding potential hazards and getting closer to the desired destination while the autonomous mobile wheeled robot is in motion. [11] An obstacle-aware autonomous wheeled mobile robot responds to information about the obstacle's position and the target's relative position. Goal-seeking and obstacle avoidance mobile robot pathways are presented in Fig. 2 of the simulation. [12]

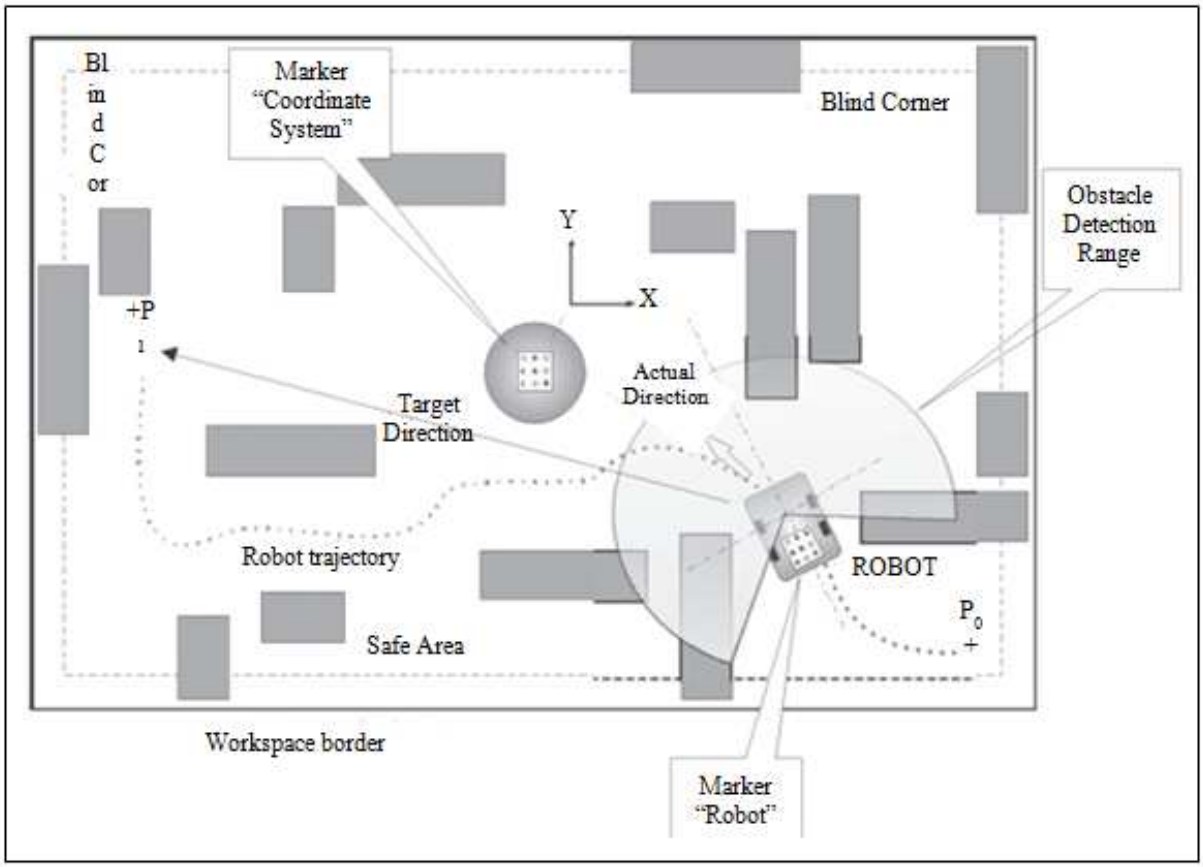

Fig 2 Obstacle avoidance trajectory of a mobile robot

An electronic device manufactured by Sun Microsystems is called Sun SPOT. As a versatile development platform, Sun SPOTs (Small Programmable Object Technology) is capable of hosting an extensive range of application modules. Fig. 3 depicts the Sun SPOT connection technique. [13]

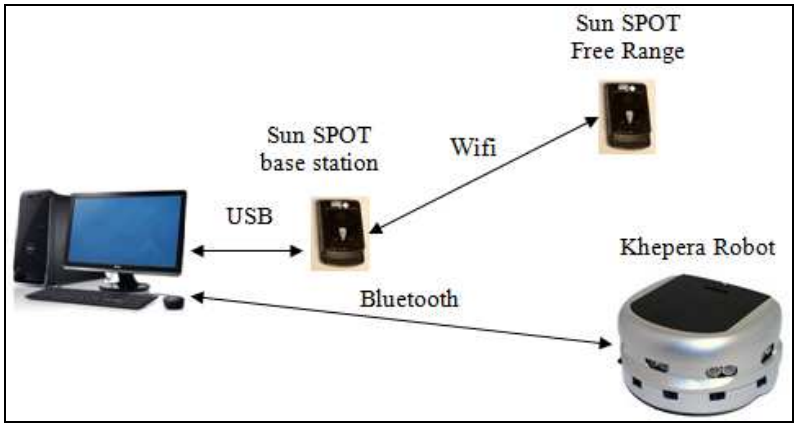

Fig. 3 Remote control system

A rechargeable battery, USB host, or an external power source are all options for powering the SPOT. In order to accommodate a wide range of application modules, the Sun SPOT was built to be a highly adaptable development platform. [14] Figure 4 illustrates how we used the SunSPOT base station to read a file from a controlling computer and deliver its contents to the second free range SPOT [15]

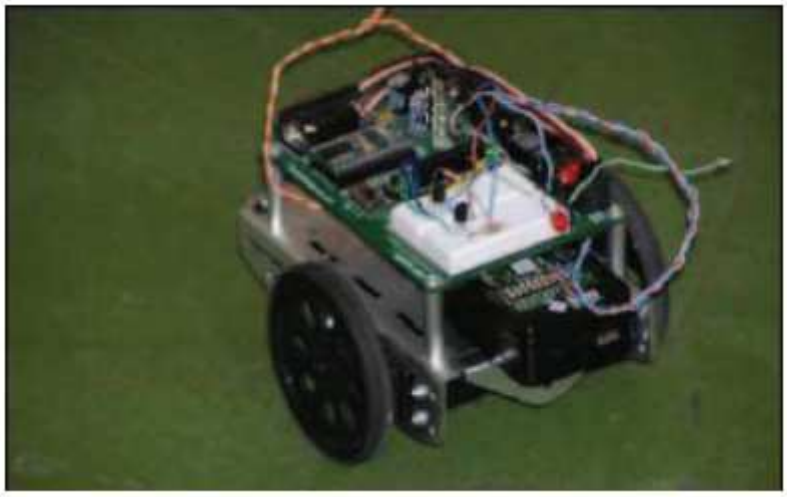

Fig 4 The Boe-Bot mobile robot with Sun SPOT device

Conclusion

The Internet of Things (IoT) is used to create an effective control system for a robotic car in this research. There is less memory usage because of the cloud service. After a predetermined period of time, all previously stored messages are automatically deleted. To make IoT more powerful, a variety of control systems will be integrated with it. Taking care of a system requires additional flexibility when working with multiple devices in different ways. In order to determine whether the combination will be sufficiently proficient, various controlling strategies have "minimal influence on time and execution compared to a single strategy" for control system. RGB-D cameras with several proximity sensors, for example, may be a viable solution to this challenge of human motion detecting and estimate.

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