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SPANKY : THE AUTONOMOUS ROBOT

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Abstract : **This project aims to develop an autonomous robot with both autonomous and remote-controlled capabilities, incorporating various hardware components and advanced functionalities. The robot is equipped with stepper motors for precise hand movements, gear motors for stable leg locomotion, and an ultrasonic sensor for obstacle detection. Additionally, it features Bluetooth connectivity for remote control via a smartphone or dedicated controller. A DF Mini MP3 module provides a welcoming voice to greet guests, enhancing its social interaction abilities. A display interface offers user feedback and interaction options. The project's objectives include achieving autonomous navigation, robust obstacle avoidance, and reliable performance across different environments. Through rigorous testing and documentation, the project aims to contribute to the advancement of robotics technology and provide valuable learning experiences in robotics, electronics, and programming.**
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IndexTerms – *Autonomous robot, Remote-controlled capabilities, Stepper motors, Gear motors, Ultrasonic sensor,Bluetooth connectivity, Autonomous navigation, Obstacle avoidance.*

• Introduction

Spanky, a versatile robotic assistant designed to greet guests with warmth and efficiency. Equipped with both automatic and remote-controlled modes, Spanky seamlessly navigates any space, extending a friendly welcome with its inviting voice and offering a courteous handshake. Its robust design allows it to effortlessly carry loads up to 60 kgs, making it an invaluable asset for various tasks. Powered by our custom- designed controller and advanced ultrasonic sensors, Spanky autonomously maneuvers through obstacles, ensuring smooth and safe navigation in any environment. Welcome to the future of hospitality and efficiency with Spanky by your side.Introducing Spanky, the epitome of innovation in robotic hospitality. Designed to enhance guest experiences with unparalleled efficiency and charm, Spanky seamlessly blends autonomous mobility with remote-controlled precision. From welcoming visitors with a friendly voice to extending a courteous handshake, Spanky sets the standard for personalized interaction in any setting.Equipped with state-of-the-art technology, Spanky boasts a robust construction capable of effortlessly carrying loads of up to 60 kgs. Whether it's delivering luggage to guest rooms or transporting supplies across a bustling venue, Spanky's versatility ensures it's up to the task. With its dual-mode functionality, operators can switch between autonomous navigation and remote control with ease, adapting to changing needs and environments seamlessly. At the heart of Spanky's intelligence lies our proprietary controller, meticulously crafted to optimize performance and reliability.

Combined with advanced ultrasonic sensors, Spanky navigates through crowded spaces with precision, detecting and avoiding obstacles with ease. This cutting-edge navigation system not only ensures the safety of guests and staff but also enhances efficiency by streamlining its movements.Welcome to a new era of hospitality, where Spanky redefines the guest experience through its seamless blend of technology and hospitality. With its friendly demeanor, robust capabilities, and intelligent navigation, Spanky is poised to revolutionize the way we interact with and utilize robotic assistants in various industries.

• LITERATURE REVIEW

These days, a lot of sectors use robots because of their high performance, dependability, safety awareness, large work hours, accuracy, and overall wonderful assistance to humans. By means of installed sensors, the robot gathers data from its environment. A few sensing tools, such as bump, infrared, and ultrasonic sensors, are employed to identify obstacles. This work has examined and discussed an obstacle detection approach based on ultrasonic sensors.

A novel indoor mobile robot navigation technique was presented in the paper. A laser range scanner, an RFID tag sensor, an ultrasonic sensor, and a mobile platform make up the robot system configuration. The topological relationship map, which illustrates the connections between dispersed RFID tags throughout the environment, is utilized as a course guide to a destination, while the RFID tags serve as landmarks for global path planning. Using the scanned range data, the robot navigates through corridors autonomously until it finds a tag. It then uses the topological map to guide its next move. Real-world robotic applications, such as intelligent wheelchair navigation, security and surveillance, and nuclear power facilities where people are present, could benefit from our suggested technique.

In the near future, we will need human-friendly robots that can support and coexist with humans in an effective manner. For this to be realized, humans and robots need to be as close as possible to one another. Moreover, it is imperative that their interactions occur naturally. A desirable human-affinitive movement for a robot is to follow a human. The human-following robot requires multiple tactics, including locating the target individual, recognizing its surroundings, and creating a reliable control scheme.An intelligent environment is used in this research to achieve these goals. An intelligent environment is a space where smart devices and sensors are widely distributed. Within this realm, mobile robots serve as real-world objects providing human services. A mobile robot is instructed to follow a walking human as closely and steadily as possible using distributed intelligent sensors. A control law based on the virtual spring model is proposed to reduce the movement gap between the human and the mobile robot. The experiment and computer simulation are used to verify that, when applied in an intelligent environment, the recommended controllegislation is successful.

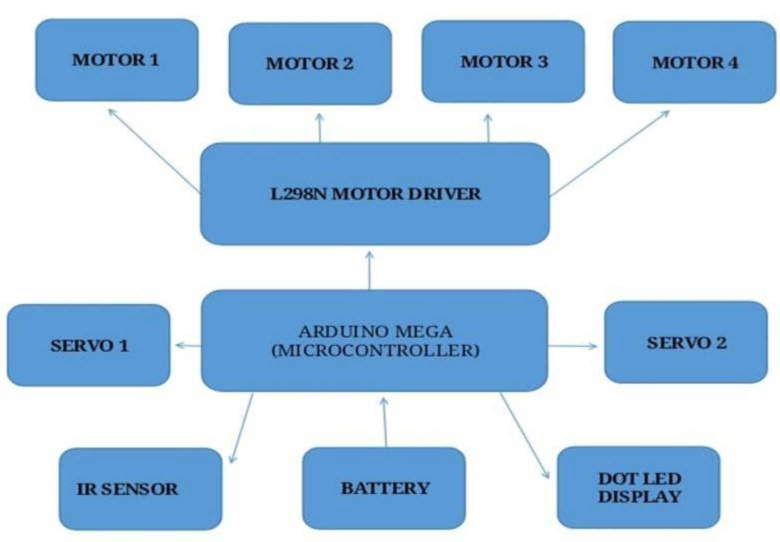
- **EXISTING SYSTEM**

In recent years, there has been significant advancement in the field of robotics, with a wide array of autonomous and semi-autonomous robots being developed for various applications. These robots encompass a range of functionalities and capabilities, from household chores to industrial tasks and research endeavors. Among the notable examples are the Roomba Robot Vacuum, which autonomously navigates rooms while avoiding obstacles using sensors, and the Arduino-based Robotic Arm, enabling precise manipulation through stepper motors controlled by Arduino microcontrollers. Additionally, Boston Dynamics' Spot Robot stands out with its advanced mobility features, remote control options, and obstacle avoidance sensors, while the Anki Vector Robot offers interactive capabilities and AI-driven autonomous navigation. The Nao Robot and TurtleBot platforms contribute to research and education, boasting advanced manipulation abilities, autonomous navigation, and integration with the Robot Operating System (ROS). For beginners, the Parallax

Boe-Bot Robot Kit provides an entry point into robotics, allowing programming for autonomous navigation and obstacle avoidance. On a larger scale, NASA's Mars Rovers, such as Curiosity and Perseverance, exemplify autonomous exploration robots equipped with various sensors for navigation and obstacle avoidance. In commercial settings, Fetch Robotics' Mobile Robots play a crucial role in warehouse logistics, featuring advanced navigation and manipulation capabilities. DIY enthusiasts can explore projects like the OpenDog Robot and OpenCat Robot, offering open-source platforms for experimentation in robotics and AI. Other notable platforms include the iRobot Create 2, NVIDIA JetBot, and Misty II Robot, each with its own set of programmable features, autonomous navigation capabilities, and remote control functionalities. Overall, these diverse examples illustrate the breadth of innovation in robotics, spanning from hobbyist DIY projects to cutting-edge research and industrial applications.

- **PROPOSED SYSTEM**

The proposed robot system integrates essential components to provide a comprehensive solution for event management. Equipped with self-driving navigation capabilities, including real-time mapping, ultrasonic sensors, and obstacle detection, the robot can autonomously maneuver and avoid obstacles in its environment. Additionally, remote control capability allows operators to manually navigate the robot when necessary. A hospitable and adaptable speech interface enables the robot to welcome important visitors and provide relevant event details. With robust construction and strong motors capable of carrying loads up to 60 kg, the robot ensures secure transportation of goods



with locking systems and a secure cargo room. Utilizing sensor data and obstacle avoidance algorithms, the robot safely maneuvers through crowded event venues. Its design prioritizes versatility and flexibility, allowing it to adapt to various event settings and perform a range of duties beyond greeting guests and lifting heavy objects. Overall, the suggested robot system offers a holistic solution for event management by seamlessly integrating autonomous navigation, remote control capability, friendly voice interface, robust load-carrying capacity, and obstacle avoidance functionality.

Figure. 4.1 Block Diagram of Proposed System

- **PROTOTYPE MODEL**

Figure.5.1. Prototype Model System

First, we get solar energy input, which is then sent to a DC compressor, which compresses and stores the air in a compressed air storage cylinder. Next, a pressure meter is used to calculate the pressure inside the cylinder. The recuperator that is attached to the pneumatic muffler serves the dual purposes of lowering noise levels and lowering system heat production. When air is released close to the turbine at a specific pressure, the turbine rotates.as a result, a DC generator is used to produce energy. In ensure that compute the current and voltage, voltmeter and ammeter are connected in this image. The power produced then glows a light

VI FUTURE SCOPE

Spanky's perceptual capabilities could see significant enhancements through the continued development of sensor technologies, enabling more precise navigation in increasingly complex environments. Integration of artificial intelligence algorithms would empower Spanky to become more autonomous and adaptive, learning from its surroundings to make better decisions. Exploring advanced materials for construction could increase Spanky's cargo capacity without compromising its energy efficiency or agility. Progress in human-robot interaction technologies, such as emotion detection and natural language processing, could enable more intuitive and personalized interactions with Spanky. Research into collaborative robot systems would facilitate safe cooperation between Spanky and humans, creating opportunities for collaborative tasks across various industries. Enhancing computational capabilities through cloud and edge computing integration would enable real-time data processing and decision-making. Customizable and modular architecture design for Spanky would ensure adaptability to different sectors and tasks, allowing for flexible and scalable deployment. Further research into power management strategies and energy-efficient propulsion systems could extend Spanky's working range and endurance. Collaboration with stakeholders and regulatory agencies is crucial to ensure Spanky's compliance with safety norms and laws, facilitating its widespread adoption in commercial and industrial settings. Ultimately, the development of Spanky serves as a catalyst for ongoing innovation and collaboration in robotics, driving advancements that benefit both society and industry..

VII APPLICATIONS

In this study, we present a comprehensive analysis of the multifaceted benefits of integrating autonomous robotic systems, exemplified by Spanky, into various industries. Firstly, the implementation of Spanky facilitates enhanced efficiency by autonomously completing tasks, leading to quicker operational processes compared to manual labor. Secondly, increased productivity is achieved as Spanky automates repetitive tasks, allowing human workers to focus on more complex and valuable responsibilities. Moreover, businesses can potentially reduce labor costs by supplementing or replacing human labor with Spanky. Safety in the workplace is also enhanced, as Spanky can operate in hazardous conditions, thereby reducing the risk of accidents. Furthermore, Spanky contributes to optimized workflow through independent navigation and task completion. Its ability to operate continuously without rest periods improves operational uptime, while consistent performance minimizes errors and output variability. Additionally, Spanky alleviates physical stress on workers by handling strenuous tasks and can enhance guest experience in hospitality environments through warm and inviting engagement. Customer happiness is also boosted by quicker service delivery and improved quality. Spanky's flexibility enables deployment across various sectors, adapting to shifting task needs and environmental variables. Moreover, it facilitates data collection for informed decision-making and process optimization. Environmental sustainability is promoted through efficient task execution and resource optimization. Employing cutting-edge robotics like Spanky enhances brand image and provides a competitive edge by increasing customer satisfaction and operational effectiveness. Furthermore, Spanky facilitates the upskilling of employees in maintenance, supervision, and operation, while also potentially creating new job opportunities in programming and monitoring. Supply chain management is improved through Spanky's self-transportation capabilities, leading to cost reduction and faster delivery times. Finally, the ongoing development and utilization of robots like Spanky drive technological innovation in robotics and related fields. Overall, integrating autonomous robotic systems offers a myriad of advantages across industries, fostering efficiency, safety, sustainability and innovations.

VIII CONCLUSION

A significant milestone in robotics technology has been achieved with the development of Spanky, an autonomous robot capable of independent movement, visitor engagement, and lifting up to 60 kg of weight. Spanky offers various benefits across multiple industries, including hospitality and logistics, by improving production, efficiency, and safety. Its operation in dynamic environments is enabled by integrating state-of-the-art sensors, navigation systems, and control methods. The robot's ability to greet visitors verbally and with firm handshakes showcases its potential to enhance human-robot communication and create memorable visitor experiences. Spanky's successful deployment underscores advancements in robotics research and development, heralding further progress in the field. With its adaptability and versatility, Spanky has the potential to revolutionize conventional workflows and processes, making it suitable for diverse applications. The interdisciplinary nature of the project, involving robotics, software development, electronics, and mechanical engineering, underscores the importance of multidisciplinary teamwork. Spanky exemplifies how robotics technology is transforming industries by enhancing efficiency and automation. By exploring how robots can complement human capabilities in various scenarios, this research contributes to the advancement of human-robot collaboration. Overall, the creation of Spanky marks a significant breakthrough in autonomous robotics, paving the way for future discoveries and applications across a widerange of industries.

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