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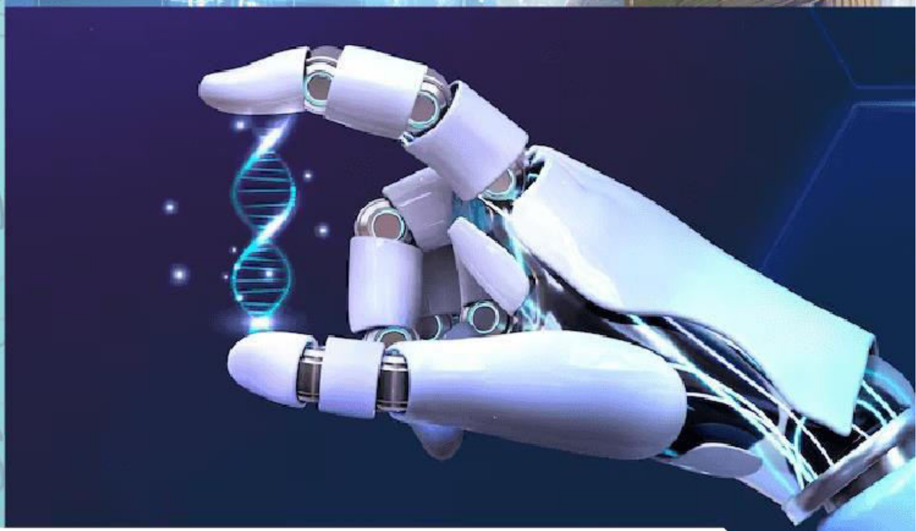

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Drainage Cleaning Robot Using Embedded System

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ABSTRACT: The objective of this proposed system is to obtain an effective low-cost and flexible solution for checking and keeping an update using sensors and collecting and analyzing sewage cleaning using Embedded Robotic System. The project is to design a remotely operated robot which will be able to clear blocks quickly at a much lower cost without any threat to human life. The robot will be lowered into the sewer pipes through a manhole. It will propel itself till it reaches the block then clear the block. The robot is tethered by data cable for communication and to prevent it from flowing away. This outcome will promptly alert the worker to stay safe and detect the toxic gases before any harm.

KEYWORDS: Ultrasonic transmitter and receiver, Temperature sensor, Gas Sensor, Pump motor.

I.INTRODUCTION

Robotic sensor networks are a promising technology for leak detection of underground water pipeline systems. It is reported that water loss percentage due to pipe leaks during distribution typically ranges from 15 to 30% in different countries around the world. Water leaks may also impose a threat of contaminant infiltration into the water supply, causing possible health disasters. Robotic sensor networks bring sensing, actuation, and communication into underground pipelines, presenting a promising approach to leak detection and cleaning of such pipe systems. Robots are mechatronic devices used to assist humans in various activities, whether dangerous or not, repetitive and unhealthy. They are used in indoor environments such as offices, hospitals, production lines, and cargo transportation in the industry. In the latter case, the Auto-Guided Vehicles (AGVs) stand out. AGVs are machines capable of moving and performing various tasks without the intervention of humans. The navigation system of this kind of robot is typically constituted by modules of perception, localization, and cognition and movement control. These modules are essential to the execution of aerial, terrestrial, and aquatic autonomous robot projects. This is proven by the different areas of activity in which this type of machine is inserted. For instance, companies use mobile robots to identify heating points in substations or cracks in pipes. Military personnel use robots to deactivate bombs and clean hostile buildings. In addition, mobile robots perform tasks such as educating, helping or entertaining, cleaning buildings and subways, or transporting food and medicine. A typical mobile robot is composed by the modules: perception, localization, navigation or movement control, and motion.

II.EXISTING SYSTEM

Mobile robotics is expanding and its contribution is present in many areas, such as exploration of environments, security, education, entertainment, performing of dangerous tasks, among many other applications. Thus, for each type of situation there is a suitable mobile robot. Evaluating the indoor case, in an industrial environment, robots with wheels are most commonly used. In case of offices, houses, and restaurants, humanoid robots can be used. When speaking of environments with uneven terrain with ramps, slopes and protrusions the ideal are robots with treads or hexapod robots. As a matter of fact, independent of the environment, a characteristic common to AGVs is the existence of a navigation system. More specifically, attention is focused on the robot’s mapping, localization, and movement control modules. The localization and navigation of mobile robots have been widely studied according to the idea of localization, whether local or global, is closely associated with the existence of a map. This map can be metric or

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topological. Metric maps capture the geometric properties of the environment, whereas topological maps describe the connectivity of different places.

III.PROPOSED SYSTEM

In the proposed system a framework is proposed for sensor selflocalization in a robotic sensor network for underground water pipeline cleaning. The SN self-localization algorithms were developed in a robotic sensor network for underground water pipeline cleaning. The objective is to track a SN's position and velocity inside a pipe based on the measurements of both the SN's velocity and the RSS of the radio from aboveground RNs. As strange as it might seem, there is no standard terminology for a robot. However, there are few essential characteristics that a robot must have and this might help you to decide what is and what not a robot is. It will also assist you to decide what features you will need to build into a machine before it can count as a robot. Robot drainage Cleaner is a machine that cleans automatically. Once it starts then Robot cleaner cleaned the whole drainage. Robot Cleaner uses two motors to control rear wheels and the single front wheel is free. It has infrared sensors, on the left, right, and front side to detect walls or any obstructs when the sensors detected any obstructs, the output of the comparator, LM324 is high logic and the other output is low. Microcontroller Atmega328 and H Bridge driver L293 were used to control the direction and speed of the motor.

Cordeiro estimates the absolute position of the robot based on odometry. Besides odometry, Santos uses computational vision for the same purpose. Regarding the use of computational vision, Bessa et al. use pattern recognition techniques in omnidirectional images to estimate the localization of the robot. Yuan et al. make simultaneous mapping and localization based on data from an RGB-D camera and non-holonomic constraints path planning algorithm. It is proposed an Extended Kalman Filter (EKF) powered by data encoders and landmarks to estimate the position and pose of the robot. Laser is used to identify static and moving obstacles, so that if the object is too close, the robot takes action to avoid collision.

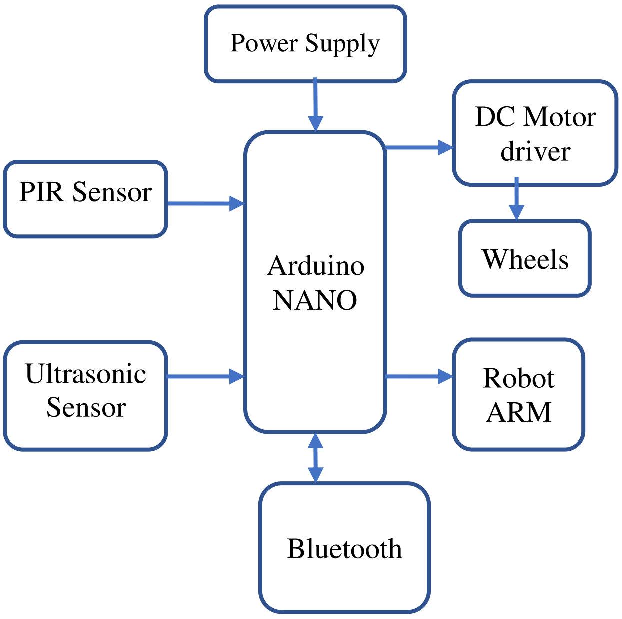

Figure.1. Block Diagram of Proposed System

In sensor networks, multisensory data fusion usually can provide more accurate perception about the environment through sensor data fusion than using data individually. In this work, due to the availability of different amount of information at different locations, the SN has different levels of confidence about its position. The SN would be more confident about its position estimates in the coverage of a RN than those obtained out of the coverage of any RN. In this sense, the pipe sections within the communication coverage of a RN are considered as high-confidence zones, and the pipe sections out of the coverage of a RN as low-confidence zones, as labelled in Figure. In this work, algorithms will be developed for the SN self-localization in different types of zones. A particularly interesting research issue is how to use the SN localization results in high-confidence zones to improve the localization results in low-confidence zones.

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Ultrasonic transmitter and receiver

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.

Figure.2.Ultrasonic Sensor

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target). The formula for this calculation is D = ½ T x C (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second).

Temperature Sensor (LM35)

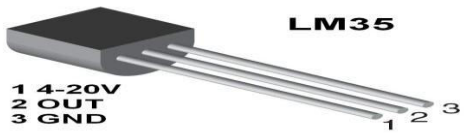

Figure.3. Temperature sensor

Temperature sensor basically measures the heat/cold generated by an object to which it is connected. It then provides a proportional resistance, current or voltage output which is then measured or processed as per our application.

Gas sensor

Figure.4 Gas Sensor

Gas sensor for detecting a wide range of gases, including NH3, NO, alcohol, benzene, smoke and CO2. Ideal for use in office, hospital, home and factory. MQ135 gas sensor has high sensitivity to Ammonia, Sulphide and Benze steam, also sensitive to smoke and other harmful gases. It is with low cost and particularly suitable for Air quality monitoring application.

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Pump motor

Figure.5. Pump motor

This DC 3-6 V Mini Micro Submersible Water Pump is a low cost, small size Submersible Pump Motor which can be operated from a 2.5 ~ 6V power supply. It can take up to 100 liters per hour with a very low current consumption of 220mA. Just connect tube pipe to the motor outlet, submerge it in water and power it.

III.HARDWARE RESULTS

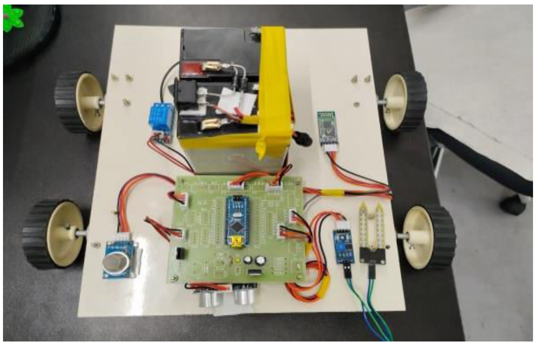

Figure.6. Hardware Result

The project consists of two 6v batteries, voltage regulator, motor driver, 2 dc motor, 1-Atmega processor, 2 IR sensor, 4 wheels & 1 cleaning brush. The two 6v batteries are connected in series connection and form 12v power thus the one end of the battery is connected to the switch and another end is connected to the voltage regulator. The voltage regulator is straight connected to the motor driver which operates the 2 DC motor. The connection of motor driver is connected to the dc motor where one motor is for the moment of wheel and another motor is for the moment of brush for the cleaning purpose. The another main part of the project is the Atmega-8a processor, which controls the 2 IR sensor and the Atmega-8a processor is feed with coding for all the working parts, one IR sensor is for detecting the obstacles and another is for detecting the end part the drainage. Once the IR sensor detects any kind of obstacle the code executes and the first motor which is connected to the brush starts functioning and clears the 49 obstacle its way later again starts sensing for obstacle when no obstacle detected by the IR sensor the robot moves forward, the process is repeated till it reaches its endpoint and when the endpoint is near the second IR sensor detects the endpoint and starts returning backward and reaches the starting point. The waste grabbing chain claw may adjust automatically by the high powered linear actuator system and other mechanical solutions. The floating abilities of the robot can be added in the future. An efficient and lighter version of the robot which will consume less energy and will be able to carry more waste than before.

IV.CONCLUSION

Sensor Node self-localization algorithms were developed in a robotic sensor network for underground water pipeline cleaning. The objective is to track a SN’s position and velocity inside a pipe based on the measurements of both the SN’s velocity and the Road Side Strength of the radio from aboveground Robotic Nodes. Based on the special architecture of the robotic sensor network, system models were presented including SN dynamics and measurement models. Different algorithms were presented based on the Kalman filter for tracking the SN’s position and velocity by taking into account whether the SN is within the radio coverage of an aboveground RN. Hardware implementation demonstrates the efficacy of the proposed SN localization algorithms and the impacts of major systems factors on the performance of the proposed algorithms.

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