Amphibot for Sewage Monitoring System

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Abstract— An estimated 1.2 million scavengers in the country are involved in the sanitation of our surroundings. Now a day's people are affecting a lot due to improper sewage control. There is a lot of sewage maintaining methods can be provided by government but it can't be worked as not too well. Technology came into existence because, without human interaction computers were able to access data from objects and devices. Amphibot can replace the human entering in the sewage for cleaning purpose and amphibot is more advanced it can easily detect the toxic gas present in the sewage. The amphibot is not only for the monitoring purpose it able to clean the sewage. This makes it essential to provide a way that can connect the monitoring and control systems to an Internet of Things platform. The proposed model provides a system of monitoring the water flow and toxic gas inside a manhole and to clean the sewage.

Key words: Amphibot, Sensors, IoT

I. INTRODUCTION

The amphibot technology is available as an upgrade option for all boat. The Amphibious system consists of motorized, retractable and steerable wheels, powering the boat with off-water capabilities. This means there is no compromise to on sewage water. Once fitted with the amphibious technology, any BOT will be able to move between land and water by the use of three retractable wheels with a hydraulic system linked to an inboard motor. So this amphibot can easily able to survive under the sewage

A. Problem Statement

The working conditions of these sewage workers have remained virtually unchanged for over a century. The sewage water is mainly composed of human and kitchen wastes. The safety of the people shall be the highest law. As safety concerns are reasonable it is necessary to implement good safety system in places of work. Toxic effluents are more often released from sewage and sanitary areas which cannot be easily detected by human senses. Acquaintance of make them preventive and bettering sewers' safety is lacking largely. The maintenance of sewage is tedious task which involves manual process of humans getting inside the drainage at multiple places. The humans getting inside the drainage are exposed to harmful gases.

The idea of the project is to track down effluents by amphibot and generate alert signal through wireless network. The hazardous gases like ammonia, hydrogen sulphide, methane and carbon monoxide turns out from sewage are sensed by gas sensors every moment and updated to the client when it surpass the normal grade and the user can see the condition of the sewage by using camera. The system will also help maintain the sewage system with continuous real time inspection over a system using IoT.

B. Technical Abstract

The project has a flow sensor, a pair of water level sensors, Carbon Monoxide sensor, Methane sensor, camera connected to a data logging system, the various gas sensors for analyzing the presence of hazardous gases in the sewage. The data logging system consists of a Raspberry pi. The module posts to a remote server every second by means of IoT. The water levels at all monitoring points along with flow rates are displayed in the computer. The camera is used to display video image and to used to control the amplibot by the user. The whole system is powered by a 12v/1A battery .The amplibot is driven by the motor driver and it is controlled by wireless (i.e)web page control

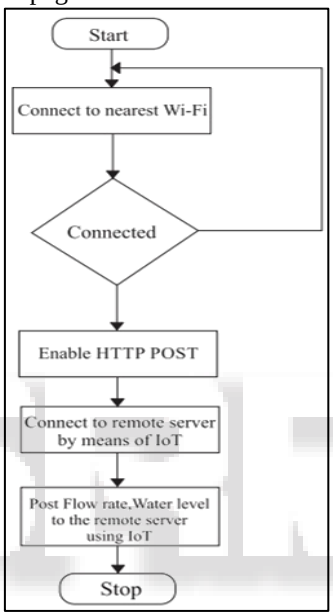

Fig. 1: Flow Chart

C. Objectives

- To prevent the people from sewage toxic gas
- To continuously monitor toxic gas present in sewage
- To reduce man hours and man power in sewage maintenance
- Detection of drainage water level and blockages in the drainage.
- Checking water flow rate continuously.
- The main objective is to obtain an effective low-cost for monitoring and cleaning sewage in the city.

D. Installation of the Project on a Real Time Scenario

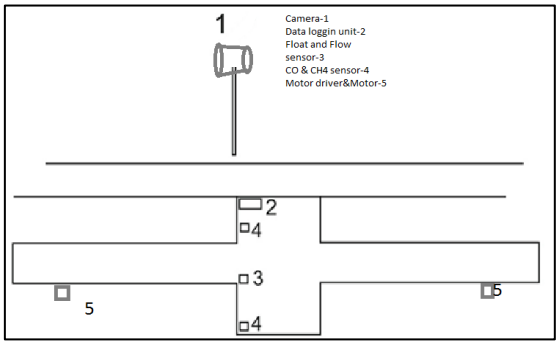

Fig. 2: Amphibot in Real Time Scenario

II. LITERATURE SURVEY

Automated Internet of Things for Underground Drainage and Manhole Monitoring System for Metropolitan Cities. Author: Muragesh S. K1 and Santhosha Rao Description: The Internet of Things (IoT) consists of real life objects, communication devices attached to sensor networks in order to provide communication and automated actions between real world and information world. IoT came into existence because, without human interaction, computers were able to access data from objects and devices, but it was aimed at, to overcome the limiting factors of human entered data, and to achieve cost, accuracy and generality factors. Sensor Network is a key enabler for IoT paradigm. It represents the implementation and design function of an Underground Drainage and Manhole Monitoring System (UDMS) for IoT applications. The vital considerations of this design are low cost, low maintenance, fast deployment, and a high number of sensors, long life-time and high quality of service. The proposed model provides a system for monitoring the water level and atmospheric temperature and pressure inside a manhole and to check whether a manhole lid is open. It also monitors underground installed electric power lines. In real time, UDMS can remotely monitor current states of the manholes. Monitoring Smart City Applications using Raspberry PI Based on IOT Authors: Prof. S A.Shaikh 1, Suvarna A. Sonawane. Description: The Smart city is the development goal to monitor the quality of resource in the city to improve good management and faster development of the city required necessity is to upgrade healthy and safe cities that delivering real time services and latest facility to implement the concept of smart city use IoT concept by which easy wireless communication is possible. The system consist of sensors, collect different types of data from sensors and transfer to the Raspberry Pi3 controller. The acquired output from the controller is sent to the control room through the E- mail and also display on the personal computer.

III. PROPOSED MODEL

This amphibot is to be designed which will be controlled by raspberry pi 3. The chassis of the amphibot will be driven by two wheel controlled by DC motors and drivers circuit. The entire amphibot is enclosed with water shield enclosure. The amphibot is made up with able to float in the water. Camera is connected to the usb port in the raspberry pi 3.The flow sensor and the toxic gas sensor connected to raspberry pi 3 GPIO pins. The entire system of the amphibot is controlled by the 5v battery. Then the amphibot is controlled by the web page.

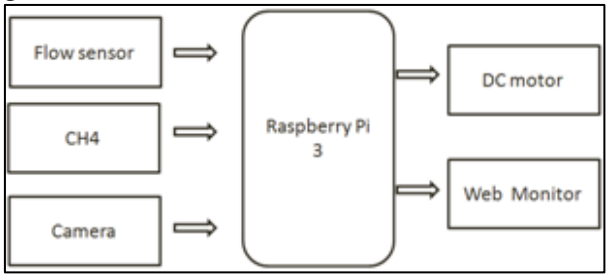

Fig. 3: Block Diagram for Amphibot for Sewage Monitoring System

IV. MECHANICAL HARDWARE SETUP

Design of an amphibot construction and control algorithm can never get any simpler than this driving technique, and the concept can be incorporated in almost any kind of robots including legged robots. One of the major disadvantages of this control is that the robot does not drive as expected. It neither drives along a straight line nor turn exactly at expected angles, especially when we use DC motors. This is due to difference in the number of rotations of each wheel in a given amount of time. To handle this problem, we need to add correction factor to the motor speed. The better option is to use dual-differential drive which can mechanically guarantee straight line motion. In this approach, each wheel has mechanical differentials and differentials combine the forces from shafts and drive the wheels. In other words, two wheels are connected to two motors where one motor controls the rotation of both wheels while the other controls the direction. Few robot builders have implemented 3L differential drive; since is it not very popular, and the results are not in any way far better than dual differential drive, we can happily skip that for the moment. The amphibot is mounted on a chassis that is fabricated from steel sheet metal. The size of the amphibot chassis based on the other components that the amphibot should carry. The amphibot carry raspberry pi, sensors, flow sensor, suction motor and the amphibot is driven through 3000 rpm DC motor. The speed of the amphibot is sufficient enough for movement in land. While in water ti can give additional power to drive fast to overcome the water speed. The battery and the control switch is mounted on the rear end of the amphibot.

Fig. 4: Chassis

V. ELECTRICAL HARDWARE

The DC motor has two basic parts: the rotating part that is called the armature and the stationary part that includes coils of wire called the field coils. The stationary part is also called the stator. The armature is made of coils of wire wrapped around the core, and the core has an extended shaft that rotates on bearings. You should also notice that the ends of each coil of wire on the armature are terminated at one end of the armature. The termination points are called the commutator, and this is where the brushes make electrical contact to bring electrical current from the stationary part to the rotating part of the machine The coils that are mounted inside the stator are called field coils and they may be connected in series or parallel with each other to create changes of torque in the motor. You will find the size of wire in these coils and the number of turns of wire in the coil will depend on the effect that is trying to be achieved.

A. Dc Motors

The armature and field in a DC motor can be wired three different ways to provide varying amounts of torque or different types of speed control. The armature and field windings are designed slightly differently for different types of DC motors. The three basic types of DC motors are the series motor, the shunt motor, and the compound motor. The series motor is designed to move large loads with high starting torque in applications such as a crane motor or lift hoist. The shunt motor is designed slightly differently, since it is made for applications such as pumping fluids, where constant-speed characteristics are important. The compound motor is designed with some of the series motor's characteristics and some of the shunt motor's characteristics. This allows the compound motor to be used in applications where high starting torque and controlled operating speed are both required.

It is important that you understand the function and operation of the basic components of the DC motor, since motor controls will take advantage of these design characteristics to provide speed, torque, and direction of rotation control. The basic components of a DC motor include the armature assembly, which includes all rotating parts; the frame assembly, which houses the stationary field coils; and the end plates, which provide bearings for the motor shaft and a mounting point for the brush rigging. Each of these assemblies is explained in depth so that you will understand the design concepts used for motor control.

VI. RASPBERRY PI

A. Raspberry Pi Board

Raspberry Pi board is a miniature marvel, packing considerable computing power into a footprint no larger than a credit card. It's capable of some amazing things, but there are a few things you're going to need to know before you plunge head-first into the bramble patch.

1) Specifications

- Chip: Broadcom BCM2835 SoC
- Core architecture: ARM11
- CPU: 700 MHz Low Power ARM1176JZFS Applications Processor - Provides Open GL ES 2.0, hardware-accelerated OpenVG, and 1080p30 H.264 high-profile decode - Capable of 1Gpixel/s, 1.5Gtexel/s or 24GFLOPs with texture filtering and DMA infrastructure
- Memory: 512MB SDRAM
- Operating System: Boots from Micro SD card, running a version of the Linux operating system
- Dimensions: 85 x 56 x 17mm
- Power: Micro USB socket 5V, 2A

B. Pin Diagram

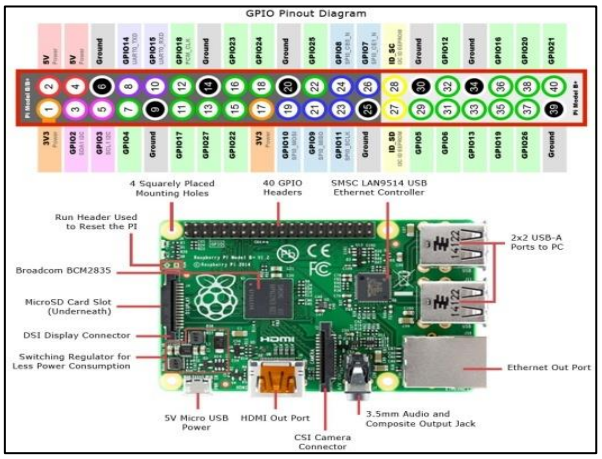

Fig. 5: Pin Diagram

C. Connector

1) Connectors

- Ethernet: 10/100 BaseT Ethernet socket
- Video Output: HDMI
- Audio Output: 3.5mm jack, HDMI
- USB: 4 x USB 2.0 Connector
- GPIO Connector: 40-pin 2.54 mm (100 mil) expansion header: 2x20 strip - Providing 27 GPIO pins as well as +3.3 V, +5 V and GND supply lines
- Camera Connector: 15-pin MIPI Camera Serial Interface (CSI-2)
- JTAG: Not populated
- Display Connector: Display Serial Interface (DSI) 15 way flat flex cable connector with two data lanes and a clock lane
- Memory Card Slot: SDIO

VII. SENSOR

A. Flow Sensor

Flow tube and liner: the flow sensor tube shall be constructed of 304 stainless steel with carbon steel or 304 stainless steel flanges, which shall conform to standards such as ansi or awwa. The sensor walls shall be lined with a non-conductive material such as hard rubber (vhe/h3b for sewage, sludge, waste water, raw water), soft rubber or novella (for sludge, abrasive chemicals and slurries) the flow sensor shall be equipped with a smart plug feature for sensor calibration data as well as a pre-amplifier. A signal pre-amplifier shall provide better immunity to noise and allow for longer cable distances to the converter.

B. Gas Sensor

Ideal sensor for use to detect the presence of a dangerous LPG leak in your car or in a service station, storage tank environment. This unit can be easily incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG concentration. The sensor has excellent sensitivity combined with a quick response time. The sensor can also sense iso-butane, propane, LNG and cigarette smoke.

Fig. 6: Gas Sensor

1) Applications

- Gas leak detection system
- Fire/Safety detection system
- Gas leak alarm
- Gas detector

2) Features

- High sensitive
- Detection Range: 100 - 10,000 ppm iso-butane propane
- Fast Response Time: <10s
- Heater Voltage: 5.0V
- Dimensions: 18mm Diameter, 17mm High excluding pins, Pins - 6mm High

VIII. CONCLUSION

The amphibot is designed a common platform for various cooperation uses. It has applied in the sewage monitoring cooperation office where the humans are working in sewage cleaning process. The amphibot continuously monitor and clean the sewage, and also it continuously update the gas level and flow level to the user. This survey has been performed for collecting the details from the smart sewage monitoring management methods that can be implemented to make city clean.

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