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Computerized Underwater Robot to Clean Water Tank

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ABSTRACT

In today's world, cleaning of storage water tanks is a tedious job. Entire work needs to be done manually, and when manual work is considered, it is a risky task. Considering height of water tanks the shortage of oxygen can be a major issue. Hence the need for use of underwater robotic systems has become more apparent. We are developing a system in which user will remotely navigate the robot the way he wants as well as control certain operations like cleaning, brushing, sucking etc. This paper surveys a state of art for underwater robotic technologies. This project aims to provide key reference for future development in automated underwater cleaning.

Keywords: Relay interface unit, RF trans-receiver,

I. INTRODUCTION

Many of today's robots are inspired by the science of bio-inspired robotics. The concept of creating machines having the ability to automate operations. It has been already assumed that it won't be long when robots will start to mimic humans.

There has been a tremendous growth of water tanks especially in a populated country like India. The need of managing these water tanks has become evident. Water is one of the most important ingredient for human beings. There is a need to ensure that the water is neat and clean because there can be possibility of impurities within the water tanks which is mostly because of formation of algae. The algae are a diverse group of organisms. They survive using photosynthesis by using carbon dioxide and water along with sunlight for energy and growth. Algae can form spore, these are highly tough cells which can survive rough treatment, even the local water purification system. Other possibilities of impure water are dust or suspended solids inside water, germs, bacteria, or parasite growth. Manual cleaning is a hectic task and may even result into accidents. Slippery floor and insufficient oxygen might cause accidents. Automated cleaning will avoid all the pitfalls encountered with manual cleaning.

II. LITERATURE SURVEY

Existing System:
There is no such automated system currently available for managing and cleaning storage tank water. Entire work needs to be done manually and when manual work is considered, it is risky task. Considering the height of water tanks the shortage of oxygen can be major issue. Because of this one cannot guarantee complete error free work.

Working in an impure tank can be hazardous to health due to presence of bacteria, parasites etc.

III. PROPOSED SYSTEM

We are developing a system in which user will remotely navigate the robot the way he wants as well as control certain operations like cleaning, brushing, sucking etc. With a key press from keyboard will send a control signal (radio frequency pulse) to robot in wireless manner which will initiate a relay and through relay it will turn on its motor in corresponding direction. As user is viewing the robot through camera, it is relatively easier and possible to move it in any direction.

This will overcome the drawbacks of previous system by eliminating manual labor. The user will be able to control the motions of the robotic vehicle wirelessly and navigate it flawlessly by observing it through implemented camera. Robot can even flush the impure water so that it can be easily drained out. This will ensure that the tank is ready for accumulation of clean water.

IV. PROBLEM DEFINITION

The storage water tanks are built at great heights. As water is one of the most important ingredient for human beings, it is necessary to keep the stored water as well as the tank clean. An underwater robotic system will help to clean the water tank efficiently without any human intervention. These robots can be operated remotely to employ complete automation. This will eliminate human errors because there is no need for one to be physically present inside the water tank. Task will be time efficient and achieve better results than manual cleaning.

V. METHODOLOGY

The prototype of computerized underwater robot to clean water tanks using radio frequency wireless trans-receivers will be implemented as follows :

- Complete layout of whole system will be prepared in the form of block diagram.
- With a key press from keyboard the key press event will be generated and will get verified by the code and corresponding hexadecimal signal will be generated.
- This hexadecimal signal is converted into binary signal and given to the LPT port.
- Using the 6 data pins of the LPT port (D0 – D5) this binary signal is given to the transistor card (interfacing card).
- Using RF transmitter this signal is passed on to the relay card wirelessly using frequency modulation technique that is FSK modulation or Amplitude modulation in encoded form.
- At the relay card, this signal will be decoded and based on the input given by the user particular action gets performed such as brushing, flushing or navigating the robot.

A. LPT port (25 pin L type)

It is one of the most used printer interfaces, as every windows/dos/linux pc has a female connector LPT1. Parallel port supports 9 bit or 12 bit input at a time. LPT ports can be used for home-made projects due to their small internal circuitry it makes the interfacing task much simple. The LPT port is comprised of 4 control lines, 5 status lines and 8 data lines. LPT port in most of the cases is found at the back of the PC near 25 Pin D-SUB female connector. TTL logic levels is used as data output to parallel port. Parallel ports are generally

implemented in ASIC and provide 12ma of source and sink.

B. BC547 transistor (NPN)

It is an negative positive negative(NPN) junction transistor. A transistor is used to amplify current. The word transistor means transfer of current. A small current at its base terminal controls larger current at collector and emitter terminals. BC547 is most of the times used for applications and switching purposes having maximum current gain of 800.The transistor terminals require a fixed DC voltage to operate the desired region of its characteristic properties. This is called as biasing. For "I" applications, the transistor is biased such as it is partly ON for all input conditions. The input signal at base is amplified and provided to the emitter. BC547 is used in common emitter related configurations for amplifiers. For switching applications, transistor is biased so that it remains fully ON only if there is signal on its base otherwise it remains completely OFF.

C. FSK Modulation by RF Trans-receivers

FSK modulation represents a frequency modulation scheme in which digital information is transmitted through distinct frequency changes of the carrier wave. Most of the early telephone line modems used audio frequency shift keying to send and receive data at rates above 1200bps (bits per second). FSK is commonly used in caller identification and remote metering applications. FSK modulation can be achieved by using radio frequency trans-receivers. RF trans-receivers will provide a complete wireless interface up to a range of 300 meters. This will ensure the working of robot within as far as 300 meters.

D. Encoder (22 and 40 MHz)

An encoder is a device or a circuit which converts information from one format or code to another, for the purposes of standardization, speed, security or compressions. Here we will make use of 2 encoders. One will be 22 MHz to drive 4 motors connected to wheels of robot. The other one will be of 40 MHz to control certain operations such as flushing and brushing. An encoder assigns a binary code to an active input line. As the motion of wheels requires less power 22MHz encoder will be enough. The remaining flushing and brushing mechanism will require a larger rpm dc motor thus a greater encoder.

E. Camera

A camera will be mounted on the robot itself, to detect and observe the impurities inside the tank. The output of the camera will be interfaced with a computer to view the contents displayed by the camera on a computer. So, it will allow user to remotely navigate the robot anywhere within the water tank. Being water proof, this camera will be able function inside water also.

VI. BLOCK DIAGRAM

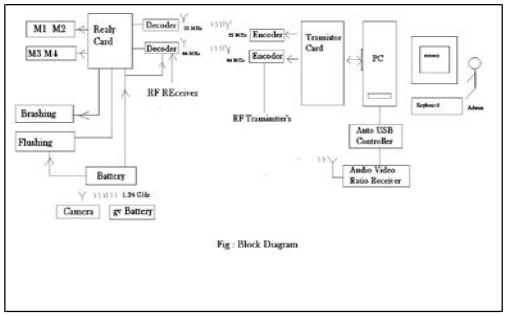

Figure 1. Block Diagram of System

VII. OVERVIEW OF ALGORITHM

A. Algorithm For Navigating Robot :-

1. Start.
2. Detect the parameter from various sensor

modules of the vehicle like the Push Sensors.

3. Feed these parameters to the Transistor Driver Card to convert analog to digital format.
4. Then forward these parallel
5. Then the Processor process these parameters.
6. At the same time the accelerometer input is given to the Microcontroller which is used as an interface to the Processor's.
7. If dust is founded then the processed parameters exceed their limit and the current co-ordinates of the vehicle are noted.
8. Then the RF trans-receiver is used to send an message to the corresponding authorities which contains the co- ordinates of the vehicle.
9. If the parameter does not exceeds the limit, goto Step 2
10. Exit

B. Algorithm For Brushing Operation :-

1. Start
2. Observe if any impurities are visible through the camera and navigate the robot to respective location.
3. If dust is found operate the brushing wheel through the key press event from system.
4. Stop

C. Algorithm For Flushing Operation :-

1. Start
2. Detect if any impurities in water are present
3. With a key press event from user, turn on the suction motor to suck impure water so that it could be drained out efficiently
4. Stop

VIII. FUTURE SCOPE

The robot can be submerged inside water completely by making entire robot waterproof with use of chromium coating on it. Fins and propellers can be attached to robot so that it can move underwater in any direction just like fishes. pH sensors can be implemented on robot to determine quantity of impurities present in water. Chlorine tube can be added to the robot to perform chlorination of water.

IX. CONCLUSION

Hence we are implementing a new idea for wireless robot control system which will clean water tank efficiently without any human intervention in addition to that it will also save manual work, avoid accidents. This automated task is efficient to brush up impure water or bacteria at the core of water tank and suck the impure water for proper reuse or disposal.

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