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+Advanced Pipeline Leakage Detector and Choke up Cleaning Robot

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Abstract - *In this project we have built the smart robot which has the capability to detect the Leakages in Pipeline. And with the help of its robotic arm it can able to clean that choke in pipeline. The main moto behind this project is to build the solution for choke up problem solving in pipelines without digging the roads and walls due to choke in pipes. We see in our day to day life that there is road digging work is going on at every certain km of road without giving the assuring that fault will be there but this system we can find the fault at exact location and without digging this road and without breaking the pipe we can remove that choke up.*

***Key Words*: TIVA TM4C123G, TCP/IP, WiFi Booster Pack,**

1. INTRODUCTION

Today we can see if there is any pipeline gets damaged then, we need the dig the road for the purpose of detecting and removing that leakage form pipeline. Sometimes it also took long time to recover this leak pipeline in that situation this robot is helpful. It does its all checking tasks automatically whenever there is leakage is detected. In traditional way if pipe is gets damaged then continuously water and liquid material which going through it comes in road or in wall so in some situations it also dangerous that it could attract the fire due to flammable nature of some liquid material like petrol and diesels. [5] So, it is always good to detect it as early possible and take actions on it. With the choke, up cleaning principle mentioned in this project with the help of that we can clean our pipe internally with help of moving brushes which removes the thick oily material which sticks on the wall of pipe due to that flow inside the pipe gets reduced so with those brushes we can remove that layer. [1]

2. System Description

In this project we have used the ARM Cortex M4 based microcontroller that's is the Tiva TM4C123G Launch Pad evaluation board from Texas Instruments. With the CC3100 WiFi Booster pack chip module. [2] As because we are controlling our robot through the internet we need to give the connectivity to our microcontroller to the external gateway so with help of this CC3100 WiFi controller board we solved that. CC3100 that inbuilt TCP/IP stack for connectivity with the Internet network and also it has the 8Mbytes of inbuilt flash memory, so it has the optimised speed for buffered data coming from internet. We have connected the two motors of robot with the Help of L293D motor driver to drive the motors as per signal come from microcontroller. We have attached the MQ 5 Gas sensor module to main board to detect the leakage of gas and gaseous liquid from pipe as it detects leakage it sends Analog signal to our microcontrollers. In programme we have set the various results of Analog sensors and according to those values we can detect the liquid gas type. If this detects the leakage, then WiFi Wireless camera streams inside video of Pipe and pipe leakage to our desktop client the Wi-Fi camera has the ability to take 360^0 Degree of video with its controllable app from mobile and desktop client. So, at that point we can dig this pipe any repair this pipeline by putting new pipe over there. For the choke, up cleaning process we does he same process by putting our robot inside this pipe and taking live stream of video then if there is extra layer of thick material of oil or likely subsequent materials then with the help of robotic arm we can remove that extra layer, In robotic arm at front side we have attached the brush which removes this layer by rotating motion of brush pads. [4]

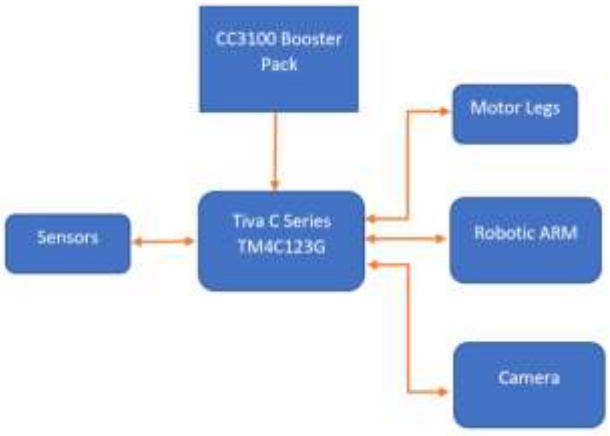

Fig -1: Block Diagram (Receiver Block)

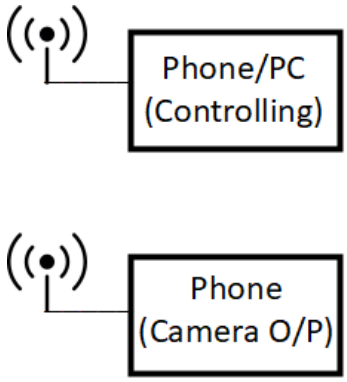

Fig -2: Block Diagram (Trans-Receiver Block)

For the user side we have designed the HTML page on our server which has various control facilities like robot's movement, Forward, Back etc as well as robotic arm movements. We have designed this HTML page because with this page we did not need to connect physical keyboard or keypad for controlling the robot and we can avoid the problem of Wiring inside the Pipes so that's why we have created this HTML Page for controlling our Robot.

3. SYSTEM DESIGN

We have designed this project in two modules as in hardware System and in Software System. So, they are explained as follows.

3.1 HARDWARE SPECIFICATION:

A. Tiva TM4C123G Launch Pad:

Tiva TM4C123G is a low-cost ARM Cortex M4 based microcontroller from Texas Instruments.

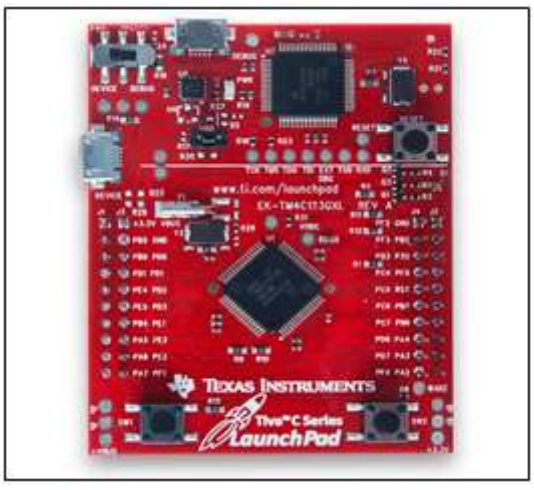

Fig -3: Tiva TM4C123G Launch Pad

It's a ARM Architecture based Microcontroller with 32 bit of processor. It has Inbuilt 256KB Flash, 32KB SRAM. With 8 UART, 6 I2C, 4 SPI pins for sensors Connectivity.

B. CC3100 WiFi Booster Pack

The CC3100 simple link WiFi booster pack is a wireless network processor plug in module for launch pad board. This board has inbuilt TCP/IP stacks for connectivity with TCP/IP Network for the information exchange this board has the first industry device to be WiFi certified by the WiFi Alliance.

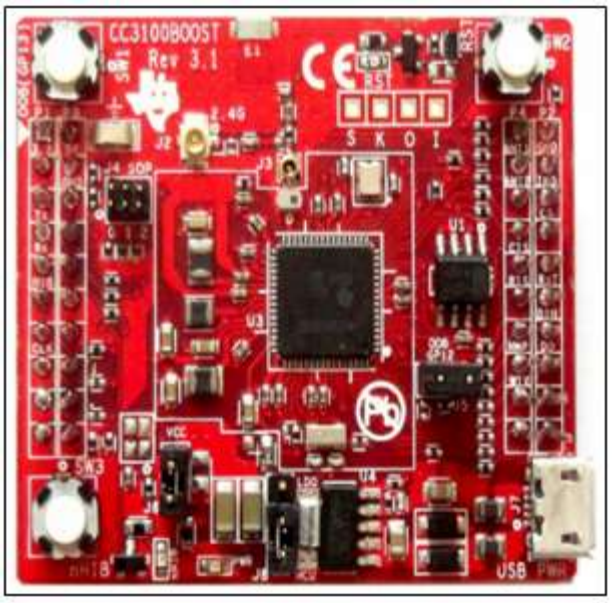

Fig -4: CC3100 WiFi Booster Pack Module.

C. Servo Motors

Servo motors are used for the angular movement of the

Fig -5: Servo Motor

Robotic ARMs Brush while cleaning. It has the precision control on its shafts while rotating. It controlled through a Microcontroller with a Servo Motor Controller Module.

D. Lipo Battery

A Lithium Polymer Battery or more correctly Lithium-ion Polymer Battery(LiPo) is a Rechargeable battery it has used the rechargeable polymer ions inside this battery.

Due to that this battery is light weight and it provides higher energy.

3. 2 SOFTWARE SPECIFICATION:

In Software side for controlling this robot we have created a server on the local host machine or in a PC. And we have designed the HTML Page for that which has user interactive buttons for controlling this robot with the help these keys. Whenever user press this key the backend java script send signal of respective buttons to the server and from there this signal is send to the microcontroller board where the action on this signal is takes place by moving that robot.

4. Result and Discussion:

The result shows that when we start the Robot we can see the insider view of 360^0 using our webcam with this we can be able to move our bot according to our convenience for cleaning. And with brushes of servo we can clean the pipe form inside.

Fig -6: ARM of Project

5. CONCLUSION

This way we have cleaned the pipe choke ups and detected the leakages inside the pipes with the help of this Robot. And changed the way of repairing this pipe leakages with this new method over the traditional method.

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