Pipe Inspection Robot Inspection And Control System

A Rajasekaran[1], K.Saraswathi[2]
[1, 2] Dept of ECE
[2] Assistant Professor, Dept of EIE
[1, 2] SCSVMV, Enathur, Kanchipuram

Abstract- *Inspection robots square measure employed in several fields of industry. One application is observation the within of the pipes and channels, recognizing and finding issues through the inside of pipes or channels. This ability is critical particularly once one ought to examine associate underground pipe. Additionally, several sensors are used on these robots to enhance the standard of examination, like vision and non destructive testing apparatuses. During this work, a review robot with ability to maneuver within horizontal pipes has been developed. Moreover, completely different unit's square measure put in on this golem, and their functions square measure examined. Management and steerage of golem within the pipes or channels square measure mentioned. The mechanism consists of a two DOF camera for observation and an unbearable unit for measurement the pipe wall thickness. All are being controlled by the operator through a joystick whereas receiving the video signal of the camera on a monitor.*

Keywords- control, inspection, monitoring, nondestructive test

I. INTRODUCTION

Inspection robots are sorts of mobile robots that create it doable to examine inaccessible places by creeping into it and being controlled remotely. Numerous today's mobile robots are used for examination, surveillance, observation and nondestructive tasks. Some current applications are as below

- permit review of inaccessible and/or risky instrumentation or work areas
- offer on-line inspection/maintenance without loss of equipment/plant accessibility
- take away humans from doubtless risky work things
- offer data regarding the health and condition of crucial plant elements to facilitate decision- creating relating to plants management
- cut back equipment/plant period of time
- improve maintenance and review procedure thorough higher coverage and documentation

The large quantity of pipeline use in several industries and also the drawback of inspecting the pipeline review robots. Several researches are done to extend the flexibility of those robots in review. a number of the works attend to fertile style of automatons and implementing new ideas in style like mechatronics another researches consider style of robot and its parts to produce micro-mechanisms and micro-robots for inspecting little diameter pipes.

In this paper, the authors gift Pipe review automaton that could be a mobile automaton for inspecting pipelines with ten to twenty inches' diameter. Style of the mechanism is so as to produce a mobile automaton that may access horizontal pipes and use the sensors that square measure placed on automaton.
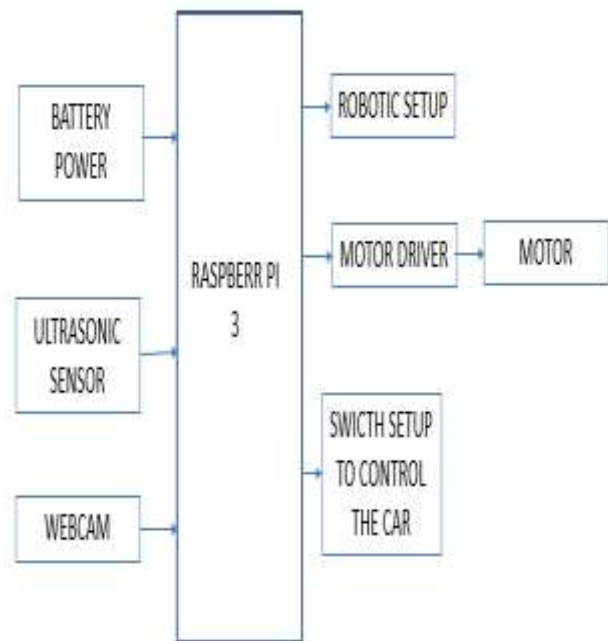
II. BLOCK DIAGRAM

Fig.1. General Block diagram of Pipe Inspection Robot System

Pipelines have abstraction application in industry. Pipes play a very important role in transmission fluids in main industries and by attention to the current that they need a restricted life and depend upon the fluid they transmit, they'll fail, the review of them become vital. When clearing the need of review and maintenance of pipelines, we should always

attend to the standard and quickness of scrutiny. During this means Pipe review mechanism is meant for scrutiny of a lot of usual diameter pipes i.e. ten to 20 inches. The inside of horizontal during this vary may be accessed by Pipe review mechanism. Conjointly horizontal pipes by additional diameters maybe inspected by Pipe review mechanism.

III. HARDWARE DESCRIPTION

3.1 BATTERIES

Batteries are the foremost common power supply for basic hand-held devices to massive scale industrial applications. Battery will be outlined as; it's a mixture of 1 or additional chemical science cells that are capable of changing hold on energy into electricity.

Fig 2: Battery Model

3.2 PRINCIPLE OF BATTERY:

A battery could be a device, that consists of a varied voltaic cells. Every voltaic cell consists of 2 half cells connected serial by a conductive solution holding anions and cat ions. One half-cell includes electrolyte and also the conductor to that anions move, i.e. the anode or negative electrode; the opposite half-cell includes electrolyte and also the electrode to that cat ions move, i.e. the cathode or positive conductor.

In the chemical reaction reaction that powers the battery, reduction happens to cations at the cathode, where as oxidization happens to anions at the anode. The electrodes don't bit each other however area unit electrically connected by the electrolyte. Largely the half cells have totally different electrolytes. All things thought of each half-cell is enclosed during a container and a separator that's porous to ions however not the majority of the electrolytes stop combining.
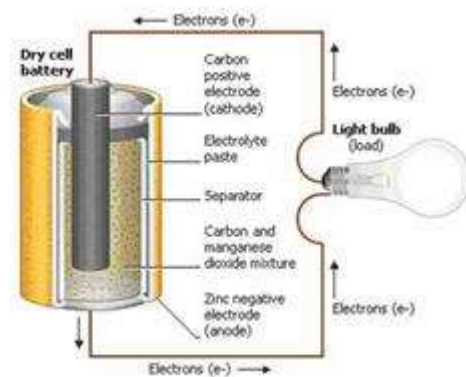

Fig 3: Battery Closed circuit diagram

3.2.1 WORKING OF BATTERY

Each half cellhas a voltage (EMF), determined by its capability to drive current from the inside to the outside of the cell. Internet electromotive force of the cell is that the distinction between the electromotive force of its half-cells. During this approach, if the electrodes have electromotive force and in different words, internet electromotive force is that the distinction between the reduction potentials of the half-reactions.

3.3 RASPBERRY PI 3

The Raspberry Pi three Model B is that the latest version of the $35 Raspberry Pi pc. The Pi isn't the same as your typical machine, in its most cost-effective type it does not have a case, and is solely a credit-card sized electronic board -- of the sort you may notice within a computer or laptop computer however a lot of smaller.

The Raspberry Pi device seems like a motherboard, with the mounted chips and ports exposed (something you'd expect to check on condition that you opened your pc and checked out its internal boards), however it's all the parts you would like to attach input, output, and storage devices and begin computing. Raspberry Pi could be a inexpensive, basic pc that was originally meant to assist spur interest in computing among school-aged kids. The Raspberry Pi is contained on one card and options ports are

- HDMI
- USB 2.0
- Composite video
- Analog audio
- Power
- Internet
- SD Card

Fig 4: Port of the Raspberry Pi

The latest version of the Raspberry Pi's official OS has the metallic element browser, the open-source browser that Chrome relies on. Its performance is affordable, as long as you do not open too several script-laden websites, and there area unit extensions that leave sleek playback of video on YouTube and alternative sites.

There area unit varied choices if you wish to use the Pi three as a media center however the foremost common decisions area unit the Kodi primarily based OSes OSM Cor LibreElec. The Pi three has the additional advantage of a rather quicker graphics processor, that the Raspberry Pi Foundation has same is ready to play native H.264-encoded video recorded at 1920x1080 resolution and sixty frames per second. Another advantage is integral support for Wi-Fi makes it easier to stream content to the Pi, where as native Bluetooth simplifies the swing up peripherals. a good vary of vintage games can run on the Pi with the assistance of emulators like RetroPie, together with some games from all of the systems listed on top of, though the newer the system, the additional doubtless it's that additional stern titles can struggle. However, the Pi will act as a Windows ten skinny shopper, wherever Windows tenis run on a server and streamed to the Pi and, with a robust enough server, the expertise will be nearly a twin of running a Windows ten machine. Performance is additionally poor, with the tools required to run Windows apps on the Pi suction up such a lot process power that you are primarily restricted to running 20-year-old Windows apps and games, and straightforward trendy text editors.

3.4 DC MOTOR

An Electric DC motor could be a machine that converts electrical energy into energy. The operating of DC motor relies on the principle that once a current-carrying conductor is placed in a very flux, it experiences a mechanical force.
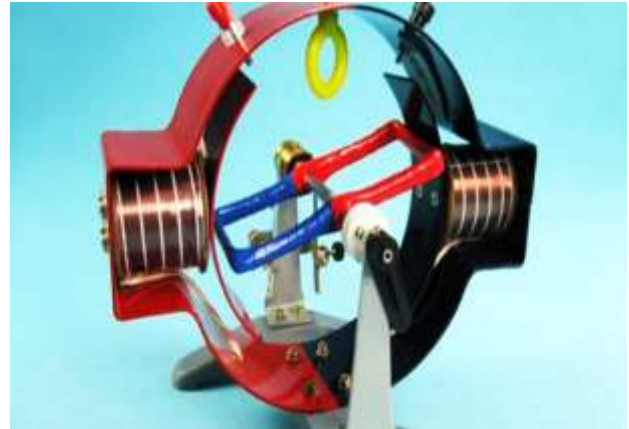

Fig 5: DC Motor

There is no basic distinction within the construction of a DC generator and a DC motor. In fact, identical dc machine are often used interchangeably as a generator or as a motor. Like generators DC motors are classified in to shunt-wound, series-wound and compound-wound.

DC motors square measure rarely employed in standard applications as a result of all electrical provide firms furnish AC.

However, for special applications like in steel mills, Mines and electrical trains, it's advantageous to convert electrical energy into DC so as to use dc motors. The rationale is that speed/torque characteristics of d.c. motors square measure way more superior to it of a.c. motors. Therefore, it's not shocking to notice that for industrial drives, d.c. motors square measure as standard as 3-phase induction motors.

3.5 MOTOR DRIVER

L298N 2A based mostly Motor Driver could be a high power motor driver good for driving DC Motors and Stepper Motors. It uses the popular L298 motor driver IC Associate in Nursingd has Associate in Nursing aboard 5V regulator that it will offer to an external circuit. It will management up to four DC motors, or two DC motors with directional and speed management.

This motor driver is ideal for artificial intelligence and mechatronics comes and excellent for dominant motors from microcontrollers, switches, relays, etc. good for driving DC and Stepper motors for small mouse, line following robots, robot arms, etc
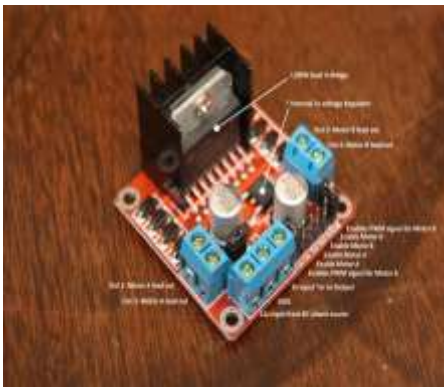
Fig 6: DC Motor Driver System

3.5.1 USAGE:

H-bridges square   measure generally employed   in dominant motors speed and direction however are often used for alternative comes like driving the brightness   of sure lighting comes like high powered junction rectifier arrays.

3.5.2 HOW IT WORKS:

An H-Bridge could be a circuit which will drive a current in either polarity associated be controlled by Pulse width Modulation (PWM). PWM could be a suggests that in dominant the period of an electronic pulse. In motors try and imagine the comb as a water wheel and electrons because the flowing droplets of water. The voltage would be the water flowing over the wheel at a relentless rate, the a lot of water flowing the upper the voltage. Motors square measure rated at sure voltages and might be broken if the voltage is applied to heavily or if it's born quickly to slow the motor down. Thus PWM. Take the water wheel analogy and consider the water hit it in pulses however at a relentless flow. The longer the pulses the quicker the wheel can flip, the shorter the pulses, the slower the water wheel can flip. Motors can last for much longer and be a lot of reliable if controlled through PWM. WEBCAM   A digital camera could be a video camera that feeds or streams its image in real time to or through a laptop to a network. once "captured" by the pc, the video stream could also be saved, viewed or sent on to alternative networks travel through systems like the web, associate degreed e-mailed as an attachment. once sent to a distant location, the video stream is also saved, viewed or on sent there. not like associate degree information processing camera (which connects victimization LAN or Wi-Fi), a digital camera is mostly connected by a USB cable, or similar cable, or engineered into component, like laptops. The term "webcam" (a clipped compound) may be utilized in its original sense of a video camera connected to the net unendingly for associate degree indefinite time, instead of for a elected session, usually activity a read for anyone WHO visits its web content over the web. a number of

them, as an example, those used as on-line traffic cameras, area unit overpriced, rugged skilled video cameras

3.6 ULTRASONIC SENSOR:

An ultrasonic sensor is associate instrument   that measures the   gap   to   associate   object   victimization unhearable   sound   waves. Associate unhearable sensing element uses   a electrical   device to   send associated receive unhearable pulses that relay back data concerning an object's   proximity.   High-frequency   sound waves replicate from   boundaries to   supply distinct   echo patterns. Ultrasonic sound vibrates at a frequency on top of the vary of   human   hearing.   Transducers are the microphones wont to receive and send the unhearable sound. Our ultrasonic sensors, like several others, use one electrical device to send a pulse and to receive the echo. The sensing element determines the gap to a target by measurement time lapses between the causation and receiving of the ultrasonic pulse.
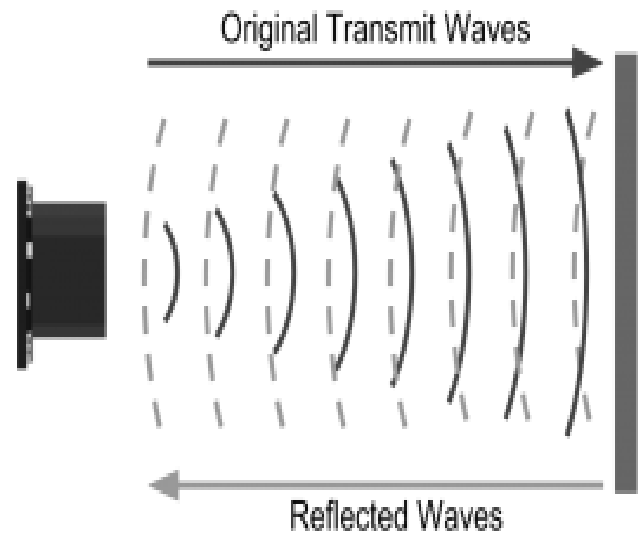

Fig 7: Working of ultrasonic sensor system

Ultrasound is reliable in any lighting setting and may be used within or outside. Ultrasonic sensors will handle collision mechanism. Ultrasonic square measure thus wide used,   they'll be faithfully enforced in grain bin sensing applications, water level sensing, drone applications and sensing   cars   at   your native drive-thru edifice or bank ultrasonic rangefinders square measure usually used as devices to observe a collision.

3.6.1   APPLICATIONS   INVOLVING   ULTRASONIC DETECTION:

The distance of obstacle or discontinuities in metals is expounded to speed of sound waves in a very medium through that waves are passed and also the time taken for echo reception. Therefore the ultrasonic detection may be used for locating the distances between particles, for police work the discontinuities in metals and for indicating the liquid level.

3.6.2 ULTRASONIC DISTANCE MEASUREMENT

Ultrasonic sensors square measure used for distance mensuration applications. These gadgets frequently transmit a brief burst of supersonic sound to a target, that reflects the sound back to the sensing element. The system then measures the time for the echo to come to the sensing element and computes the gap to the target victimization the speed of sound among the medium. Different types of transducers square measure utilized among industrially accessible ultrasonic cleansing devices. Associate degree ultrasonic electrical device is glued to a chrome steel pan that is stuffed with a solvent and a sq. wave is applied to that, conferring vibration energy on the liquid

3.6.3 ULTRASONIC DISTANCE SENSOR:

The ultrasonic distance sensors measures distance using sonar; an ultrasonic (well higher than human hearing) beat is transmitted from the unit and distance-to-target is set by mensuration the time needed for the echo come. Output from the ultrasonic detector could be a variable-width beat that compares to the space to the target..

IV. CONCLUSION

In this paper several challenges got to be removed to supply this product. Complicated emissions like ultrasonic check created the work a lot of delicate. Smart fertile and part style may manage all the issues. The types of review tasks area unit terribly completely different. A standard style was thought-about for PIC which will be simply tailored to new environments with tiny changes. Completely different management algorithms may well be dead on this manipulator. However, up sensoring system like force sensors may improve the golem management.

REFERENCES

[1] K. Suzumori, T. Miyagawa, M. Kimura and Y Hasegawa, "Micro examination golem for 1-in Pipes", IEEE/ASME Transactions on Mechatronics, Vol. 4, NO. 3, 1999

[2] K. Suzumori, K. Hori and T. Miyagawa, "Designs for Pipe-Inspection small robots and for Human-Care Robots", Proceedings of the IEEE International Conference on AI and Automation, 1998, Leuven, Belgium.

[3] K. Tsuruta, T. Sasaya, T. Shibata and N. Kawahara, "Control Circuit in Associate in Nursing In-Pipe Wireless Micm examination Robot"International conference on small mechatronics and Human Science, IEEE, 2000.

[4] S.G. Roh, S.M. Ryew, J.H. Yang, H.R. Choi, "Actively dirigible In pipe examination Robots for Underground Urban Gas Pipelines", Proceedings of the IEEE International Conference on AI & Automation, Seoul, Korea, 2001International Conference on Intelligent Robots and Systems, 2000

[5] Y. Kawaguchi, I. Yoshida, H. Kurumatani, T. Kikuta and Y. Yamada, "Internal Pipe examination Robot", IEEE International Conference on artificial intelligence and Automation, 1955.

[6] H.B. Kuntze and H. Haffner, "Experiences with the event of a automaton for sensible Multisensoric Pipe Inspection", p1773–1778, IEEE Press, 1998

[7] G.L. Hovis, "Pipe Crawler Apparatus", us Patent, Patent vary half-dozen,427,602 B1, 2002

[8] K. Watson, N. Shilelds, R.P. Ashworth and F. Hall, "Pipeline scrutiny vehicle", us Patent, Patent No: 5,351,564,1994

[9] M.D. McKay, "Minimature Pipe Crawler Tractor", us Patent, PatentNo: 6,035,786,2000

[10] E. Rome, J. Hertzberg, F. Kirchner, U. Licht, H. Streich, and Th. Christaller, "Towards Autonomous Sewer Robots", Urban Water, p57– 70, 1999.

[11] K.-U. Scholl, V. Kepplin, K. Berns, and R. Dillmann,"Controlling a Multi joint golem for Autonomous Sewer Inspection", IEEE/RAS International Conference on robotics and Automation, 2000.