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A Technique for Monitoring the PC Based Overhead Crane with RF Controller System

Kajal Verma*

*Assistant Professor, Computer Science & Engineering, CCET, Chhattisgarh, India, ***kajalverma.csit@gmail.com***

Abstract

This paper presents a new method which can be adopted for operating the overhead crane by using PC (Personal Computer), RF (Radio Frequency) and camera processing method the controlling can be done by a particular distance. Now a day`s the crane movement is directly controlled by the crane operator, this however severely limits the crane speed because of human inability to manage the crane optimally. By this process, a single employee can operate the crane from longer distance by observing the position of each and every movement of the crane by camera processing method and by radio frequency controlling system this crane can be operated. The method utilizes PC vision to determine load position that is employed to manage crane movement optimally. For example construction work, shipbuilding, cargo transportation and cement industry. In this method with the help of PC the monitoring can be possible to camera processing system and accessing the monitor and controlling can operate the system by touching the push button operation. According to the technology, for maintaining work, the intimation of the PC monitor show that the accident levels decrease on controlling the overhead crane by the operator.

Index Terms: **Overhead Crane, PC, Block cipher, Sensor, Arduino, Relay Controller Unit, Microcontroller**

1. INTRODUCTION

Controlling a crane is commonly very tough for human operators because of the slow response of the heavy structures and also the lightly-damped payload oscillation. Manipulation tasks are created even harder when the interface between the human and crane is unintuitive. Although there have recently been significant advancements in moveable electronic devices useful technology has not migrated into crane control applications. Human manipulation of suspended payload using

Cranes can be tough. This touch screen allows an operator to move freely around the workplace and drive the crane with an easy graphical user interface. The operational effect of the touch screen was compared to that of a standard pendent interface through a series of human operator performances. The touch screen provides larger operator mobility while producing comparable manipulation performance.

In order to accelerate during a reasonable manner, a controller is required. This controller should facilitate the operator by limiting crane acceleration, while still leaving the operator in control. It is possible to construct such a controller by calculating the highest permissible acceleration from previous control signals. However, that is a solution of limited usefulness since the system needs to exactly know the load weight. In order to determine load position some form of sensor is needed.

Thoughts were given to use accelerometers but were discarded because of the difficulty in eliminating drift. The next alternative is to use digital camera and computer vision to determine load location. The idea would be to use a single digital camera to capture images and have a PC analyze them in real time to find the load. The cargo coordinates would then be passed on to the controller which might limit acceleration. The possibility to use computer vision to modify the process of moving trolley, the controller should be able to move load from one coordinate to another as fast as possible and with minimum amount of sway.

The basis of solving the problem is locating the load. A PC that can detect and track the trolley in real time must be developed. This is a process which can be optimized with the help of control theory. By the construction, cranes are divided into two parts, overhead crane and gantry crane. Overhead and gantry cranes are generally used for moving containers, material storage or loading trucks. This crane type usually consists of three separate motions for transporting material.

The primary motion is the hoist that raises and lowers the material. The second is the trolley (cross travel), that permits the hoist to be positioned directly on top of the material for placement. The third is the gantry or bridge motion (long travel), which permits the complete crane to be moved on the working area. While moving load, the crane operator must check that the crane motion does not cause the load to accelerate too quickly, because the load could then start to oscillate. Such motion could disrupt unsecured load and place unnecessary stress on secured loading.

1.1 Internet of Thing (IOT)

The IoT can include billions of digital devices, people, services and different physical objects having the potential to seamlessly connect, interact and exchange data about themselves and their environment. This can make our lives less complicated through a digital environment that may be sensitive, adaptive, and responsive to human needs.

It will combine the ability of universal network connectivity with embedded systems, sensors, and actuators in the physical world. This new idea involves objects of our everyday life, like clothes, cars, smart cards, which will} be able to reveal information about themselves, interacting with one another and with the environment. IoT will, therefore, add a huge range of new industrial opportunities to the software system and hardware markets.

The Internet of Things (IoT) is defined as "a pervasive and present network that allows observation and control of the physical environment by collecting, processing, and analyzing the information generated by sensors or smart objects."

The concepts and technologies that have LED to the IoT, or the interconnectivity of real-world objects, have existed for a few time. Many people have referred to Machine-to-Machine (M2M) communications and IoT interchangeably and consider them one and the same. In reality, M2M is viewed as a subset of the IoT. The IoT is a additional encompassing phenomenon, which includes Machine-to-Human communication (M2H), radio frequency Identification (RFID), Location-Based Services (LBS), Lab-on-a-Chip (LOC) sensors, increased Reality (AR), artificial intelligence and vehicle telemetric.

Many of these technologies are the result of developments in military and industrial provide chain applications; their common feature is to combine embedded sensory objects with communication intelligence, running information over a mixture of wired and wireless networks. in a broader context, the architecture encompasses the internet of Things and business engineering insights captured from the information transmitted by these so-called "smart objects."

The main focus and scope of this paper is only on the security aspects of the internet of Things.The capability of embedded and distributed intelligence within

The network is architectural part of the internet of thing for three main reasons:

1. **Information Collection**: good object managementand Centralized information collection don't provide the scalability required by the web. as an example, managing many million sensors and actuators in a very good Grid network cannot efficiently be done using a centralized approach.

2. **Network Resource Preservation**: because networkbandwidth is also scarce and collecting environmental information from a central purpose in the network unavoidably leads to using a great amount of the network capacity.

3. **Closed-loop system Functioning**: for some usecases, the IoT requires reduced reaction times. For example, sending an alarm via multiple hops from a device to a centralized system before sending an order to an actuator would entail unacceptable delays.

1.2 Security in Internet of Thing (IOT)

One of the basic components in securing an IoT infrastructure is around device identity and mechanisms to certify it. As mentioned earlier, several IOT devices may not have the specified calculate power, memory or storage to support the present authentication protocols. Today's strong encoding and authentication schemes are based on cryptographic suites like Advanced encoding Suite (AES) for confidential information transport, Rivest-Shamir-Adleman (RSA) for digital signatures and key transport and Diffie-Hellman (DH) for key negotiations and management. While the protocols are strong, they need high compute platform Ñ a resource that will not exist in all IoT-attached devices.

Consequently, authentication and authorization would require applicable re-engineering to accommodate our new internet of thing connected world.

Secondly, these authentication and authorization protocols also need a degree of user intervention in terms of configuration and provisioning.

However, so requiring initial configuration to be protected from tampering because of several internets of thing devices can have limited access, theft and different types

of compromise throughout its usable life, which in several cases could be years.

In order to overcome these problems, new authentication schemes that can be designed using the experience of today's robust encryption/authentication algorithms are needed. The good news is that new technologies and algorithms are being worked on. for example, the National Institute of Standards and Technology (NIST) has recently chosen the compact SHA-3 because the new algorithm for the supposed "embedded" or smart devices that connect with electronic networks, however, are not themselves full-fledged computers.

1.3 Block Element

In this paper block element is a key element. By using the some parameters of block element, we identification of the position of trolley on calculating the integer multiplication of 4-bit working registers instead for 2-bit registers.A block element is a operating on fixed-length groups of bits, called a block. Block element operate as important elementary components, and are widely used to implement convert of bulk data. Even a secure block element is suitable only for the convert of a single block under a fixed key. Block element have one or more block sizes, but during transformation the block size is always fixed. Block element operate on whole blocks.

In block element the input is divided into a number of blocks. Each blocks having fixed number of elements. A block element works on units of a fixed size known as a block size but inputs come in a variety of lengths.Block element operate whole blocks and need that the last a part ofthe data be padded to a full block if it is smaller than the present block size. Starting variable may be a block of bits that'sutilized bymany modes to disarrange the coding and hence to produce. Block cipher modes operate whole blocks and need that the last a part ofthe data be padded to a full block if it is smaller than the presentblock size. Beginning variable may be a block of bits that'sutilized bymany modes to disarrange the coding and thusto supply distinct cipher texts even ifa similar plaintext is encrypted multiple times, withoutthe requirement for a slower re-keying processes distinct cipher texts even ifthe same plaintext is encrypted multiple times, withoutthe need for a slower re-keying process.

2. RELATED WORK

Overhead cranes area unit wide employed in numerous fields, like serious industries, seaports, automotive factories, and construction facilities. Factories usually (Kulka Jozef , et. al. 2015) [1] use track-mounted cranes to maneuver materials and instrumentality from one location to a different and so Gus tracks area unit wide employed in several industrial plant sites. Crane track beams, determination of residual durability of designated beams and suggestion of necessary measures with regard to the possibility of future operation of the whole crane track. The most seriously loaded beams in one of the metallurgical plants were analyses.

Overhead cranes square measure [8] wide employed in numerous fields, like significant industries, seaports, automotive factories, and construction facilities. Factories usually use track-mounted cranes to maneuver materials and instrumentality from one location to a different and so constellation tracks square measure wide employed in several manufacturing plant sites.

(Nguyen Quang, et. al. 2014) [2] Proposes a unique off-line trolley car mechanical phenomenon designing methodology for under actuated overhead cranes. The projected technique is feasible and economical for overhead crane operation. Dynamic coupling between trolley car motion and payload swing was with success exploited using a steps sort of trolley car acceleration. The payload swings within the constant rate section were expeditiously suppressed and the trolley car reached the specified position exploitation this method. The affordable variety of stairs is determined by evaluating the residual oscillation amplitude in keeping with the quantity of stairs and variation within the natural frequency of the setup.

A style technique supported the energy and passivity of the system has recently been investigated. This approach has been successfully applied within the management of under actuated systems like overhead cranes. A controller that has the passivity of the payload swing by exploitation the payload as finish effectors of a manipulator has been developed [9].

Non-destructive detection of structural element of track crane could be a difficult and costly drawback. Within the ,acoustic emission (AE) was used to find two types of typical welding defects, that is, welding body and incomplete penetration, in the truck crane boom. Firstly (Tao Yong. et. al. 2014), [3] a subsidiary check specimen with special preset welding defect was designed and added on the boom surface with the help of steel plates to get the synchronous deformation of the main boom. Then, the AE feature information of the welding defect could be got without influencing normal operation of equipment.

To develop (Mohammad H. Fatehi. et. al 2015) an

advanced control system for an overhead crane while considering the large angle of the cable swing, with transverse vibrations of the flexible cable [4]. The control objective is to move the payload to the desired position and at constant time, to reduce the payload swing and to suppress the cable transverse vibrations only by applying a directional (horizontal) drive to the trunk. The Crane system with cable vibrations and large swing angle are categorized as a multi-degree under-actuated system whose characteristics impose serious challenges once applying control methods.

Cranes are used extensively in a very reasonably application in industries. (Fatehi Mohammad H., et. Al 2014) [5] the most purpose of using cranes in onshore/offshore construction sites, transportation trade, etc., is the point-to-point transportation of the suspended load horizontally, by means that of cables and a support mechanism. Cables possess an inherent flexibility and don't offer resistance to bending moments or compressive forces and may only develop tension. Such natural characteristics inevitably cause deflection within the cross direction of the cable.

The suspended load is usually subject to swings caused by unskilled operators or by disturbances usually elicited by motor drive transients, the wind, and collision with objects. Therefore, the behaviour of a crane system with flexible cable involves three forms of motion, linear motion of the trolley, swing motion of the payload as a Pendulum motion, and cable vibration [5].

The payload swing [6] can cause long transporting activities and even it can become large and reduce safety in crane actions, so the development of an effective control system so as to reduce and suppress the payload swing and cable vibration inside a given amount of time is important. So as to achieve this objective, a lot of practical and correct model with a lot of details for crane systems is needed.

Today's world risk of intrusion has increased within the developing technology. (Indrajit Patil1, Saurabh Jaiswal., et.Al 2016**)** [12] Crime interference using remote monitoring is one in all the aims of current Study. There are several observation systems like camera, CCTV etc. However, nowadays although the person is moving from one a place to a different place person will monitor and stop the criminal activity. A video closed-circuit television is very important in different Fields of the environment such as in personal security, banking, etc. However, it's costly for normal peoples to set up such kind of system that the peoples are using IOT primarily based low-value security systems which are able to facilitate them for secure their industrial places.

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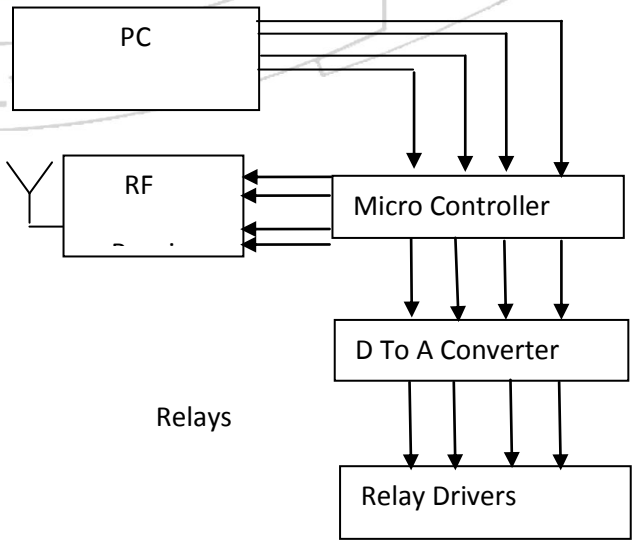
3. METHODOLOGY

The overhead crane is being operated by the liver operations at the control point and in an advanced method; the liver operation converted to button push operation decreased the effect of the worker to operate the whole overhead crane.

But by connecting the RF signal in system and by camera processing one can observed the position of the lifter or grasp by monitoring in a monitor screen and by operating the system with button push operation which is employed from PC to frequency transmitter and from the frequency transmitter to atmosphere and from that atmosphere to the receiver and processes in a electronic processor unit that is by PLC (Programmable logic Controller) or by new microcontroller and feed to operate several relays and relays are employees to operate the subsequent motors, who make the movement to overhead crane operation.

In this diagramusingcomputer (Personal Computer) and this computer serially connected with the microcontroller. The microcontroller is additionally connected with RF (Radio Frequency) Receiver that receives the data through frequency and D to A devicethat is digital to analog convertorconverted the digital signal to analog signal. The D to A converter is connected with relay drives. Those relay drives additionally connected with some relays usingsupply to motors.



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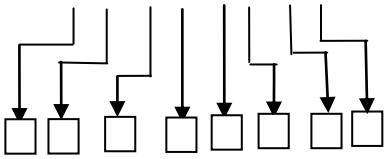

Supply to Motors

Fig-3.1. Block Diagram ofA Technique for MonitoringThe PC Based Overhead Crane with RF Controller System

PLC (Programmable logic Controller) or by new microcontroller and feed to operate several relays and relays are number of employees to operate the subsequent motors, who make the movement to overhead crane operation.

The program loaded in the microcontroller 89s52 the command form the PC is received and according to the software program the instructions of output is being accurate by output port of the microcontroller and which is fitted to the relay drives to drives the relay and by which the relay fit the supply to the motors.

In this way by calculating the distances through algorithm fitted in PC and one can easily provides the instruction for distances operation and stopping the motors. For monitoring the distances of operation in PC the actual picture of the overhead crane is being transferred through internet as well as PC by camera processing system.

The observation for the operator can be maintains in two main functions-

1. One by camera processing through internet and IP address accessing system.

2. The other by scaling measurement which is being fitted in PC.

The electrically several component are employed for working the hole crane by combing each circuit in close circuit manner with the help of several circuit to be function just like IR (Infrared) sensors module, PIR (Passive Infrared) Sensors module, MC (microcontroller) module, Relay drives module are connected in close circuit manner to complete close circuit to perform the operational work efficiently.

S.No.	Swing Right to Left	Maximum Time for Swing	Minimum Time for Swing	Swing Management Time
1.	Full Swing	3.6 Second	1.5 Second	4 Second
2.	Medium Swing	2.5 Second	1 Second	3 Second
3.	Lower Swing	1.5 Second	0.5 Second	1 Second

Table 1. Swing Management Time

The IR Sensors is used for measuring the distances of the trolley Right to Left and Two and Flow (up and down). In overhead crane the trolley is moved from starting position to the end position.

The trolley is swing right to left in 3 way- full swing, medium swing and lower swing. In this Table 1. Shown maximum time and minimum time for the swing and swing management time. In trolley is taken maximum time is 3.6 second and minimum time is 0.5 second.

S.No.	PIR Sensing Right to Left	Maximum Distances for PIR Sensing	Minimum Distances for PIR Sensing	PIR Sensing Manage-ment
1.	Full Sensing	12 cm	1 cm	3.5 cm
2.	Medium Sensing	6 cm	0.5 cm	1.5 cm
3.	Lower Sensing	3 cm	0.25 cm	0.75 cm

Table 2. PIR Sensors Management

In Table 2. Shown as PIR sensing management, in this table maximum distances for PIR sensing is 12 cm and minimum distances for PIR sensing is 0.25 cm.

The Infrared Sensors (IR) module is an electronic device that emits in order to sense some aspects of the surrounding. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED.

The Passive Infrared Sensors (PIR) sensor module is used for motion detection. It can be used as motion detector for security system. It works on 5V DC and gives output which can be directly given to microcontroller or to relay through a transistor. This PIR module is extremely sensitive to change in infrared levels subjected by human movement.

3. CONCLUSIONS

A system related to over head crane is to be implemented by programming in PC for automation by distance calculation Operation can be provided by note pressing in the key board and observing the position of the over head crane by camera processing method. The benefits of this method are, According to technology for maintained work the intimation of the fact can be miniaturized in the PC monitor show that the accident levels go decrease for controlling the overhead crane by the operator. According to the safety measurement all the safety nodes are machines show that the accident level may go slow.

Due to button push operation and low voltage controlling it become very easier form the employees to work efficiently. The commercial benefit may increase due to attachment of this system that one employee can operated this system for his duty hours and by this system the commercial benefit can increase because one employee can operated perfect monitoring is being observed by the operated through sensor attachment in this system. Increase the pre-intimation of the further occurs in the crane. So that the time to time maintains can be processed heavy demise of the system.

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