Automatic Railway Gate Controller with Alerting System

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ABSTRACT- This paper deals mainly with the automation in unmanned and manned railway crossings. In recent days the accidents in railway level crossing are increasing. There are two types of level crossing Manned and Unmanned. The accidents occurring in both level crossings are very severe. Our work uses simple mechanical and electrical components to control the railway gate. The Infrared detector which is placed at a few distances away from the gate detects the train and sends the signal to the controller. From the controller the signal is send to the timer which is connected to display near the gate. Timer displays the time remaining for closing or opening of the gate according to the necessary situation. The power is transmitted from the controller to the motor which is connected to the L-shaped cylinder through the pinion of rack and pinion arrangement. This rotary motion of the pinion produces the linear motion of the rack. This linear motion of the rack actuates the horizontal and vertical piston one by one of the L cylinder which in turn opens or closes the gate. Thus our paper presents a highly secured and safe automated level crossing at low cost, which requires no human monitoring.

IndexTerm-Arduinouno,power supply unit,PIR and IR sensor ,RF transmitter and Receiver, Internet oftechnology

I.INTRODUCTION

Therailwaysystemisthemostcommonlyusedtransportation mode in India. It is also one ofthosemodes of transport that facesa lot of challenges duetohumanerrorssuchaslevelcrossaccidents,collisions duetobrokentracketc.Alevelcross,anintersectionofaroad andarailwayline,requireshumancoordination,thelackof whichleadstoaccidents,alsothemainproblemaboutrailway analysis is detection of thecrack in thelocation. Ifthis problem are not controlled at early stages theymightlead to a number of derailment resulting inheavy lossof life and property. In traditional systemlevelcrossings aremanagedby thegatekeeper andthegatekeeperisinstructedbythemeansoftelephone at most of the level cross from the controlroom. But the rate of manual error that could occur attheselevelcrossesarehighbecausetheyareunsafeto perform without actual knowledge about the traintime table. Delay in the opening and closing of thegate could lead to railway accidents. In order to avoidthehumanerrorsthatcouldoccurduringtheoperation of gates and derailment due to crack, theproposedpaperintroducestheconceptofrailwaygate automation and crack detection system has beenmodified by using IR sensors and IOT (Internet ofThings) technology which performs automatic gateoperationand helps in detecting of the faulty track.TheIOTrepresentsthecoordinationofmultiplevendors' machines, devices and appliances connectedto the Internet through multiple networks. To find thelocation of the faulty track, we have designed IOTwebsiteusingXammpsever.Wehavealsoused power supply unitandrduino controller.Power supplyisusedtoreadthecurrent latitude and longitude data. Arduino controller isusedto send the current latitude and longitude dataonhostedserver.

The rest of paper is organized as follows .SectionII gives a review of the previous papers that relate toourwork.SectionIIIdescribesaworkingofproposedsystem.Theexperimentalresultsarediscussed in Section IVand theconclusion of theworkisdiscussedinSection

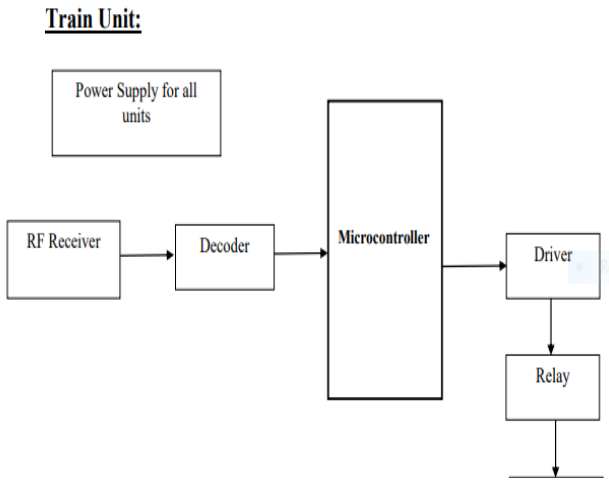
II.LITERATURESURVEY

Securityintheunmannedrailwaycrossingshasalways been a matter of uncertainty. Many varioussystems have been proposed and some implementedbut they have some shortcomings. Some system havepoor stability and performance while others utilizeactive sensors which defects like instability and shortreliable life cycle. Hence requiring replacement everyfew years and thereby

making the system expensive.FMcommunicationsystemhasbeenusedtoautomaticallyclosegates.ThereareIRtransmittersandreceivers.Alsosensorsarepresenton either side of the level crossing at a distance of1km.Hencedependingontheactivationofthecorresponding sensors, the closing and opening of thegate are performed [1] . A GPS receiver was designedandoperatedtomonitortheL-bandamplitudescintillations. Thus the ionospheric irregularities aremonitored [2]. Zig- Bee based train anti-collision andlevelcrossingprotectionsystemconsistsof4modules:trainmodule,controlcentermodule,signalingpartmodule,andlevelcrossinggatemodule [3].MicrocontrollersandIRsensorshavebeen employed to automatically close the gates at thelevel crossings. Hence, the errors due to manual errorcanbeavoidedandafastresponsesystemisobtained[4] . A programmable logic controller can beusedtoautomaticallyclosegatesatthelevelcrossings. These controllers can be programmed forrespectivemechanismsofoperations,technicaldiagnosticaidinginfaultdetectionandremotemonitoring[5].Aprogrammablelogiccontrollerbasedarrangementusingtheladderdiagramisdesigned and programmed which can be employed atall the unmanned level crossings. This has proved tobeaneconomicalsystem[6].Atrackmonitoringsystem using a probe-vehicle system was designed.Here the rail irregularities are estimated. GPS andmapmatching techniqueshave been usedto locatethe faults on the tracks. In-service vehicle were usedto carry out the experiments [7]. The usual railwayinterlocking devices comprising of large wiring andcablesisreplacedby utilizing opticalLANwhichsignificantlyreducesthesignalcablesandwiringworks.Adata-drivenmethodwasemployedtoreplacetheinterlockingdeviceandmakingoperations easy[8]. GPS and GSM were used for acrossingwarningsystem.Thisincreasespassingefficiency in railway crossing [9].A swift responsesystemusingapressuresensorisusedforanautomatic railway gate control. The sensor senses thearrival and departure is train to control the openingand closing operations of the gate. Operation of thesystem is controlled by a microcontroller. Hence itconsistsofmotor,IRsensorandmicrocontroller[10].Selvamrajusomalraju et.al proposed a system thatutilizesLED-LDRconfigurationforrailwaycrackdetection.RRCDSutilizessimplecomponentinclusiveof GPSmodule,GSMmodem andLEDbasedcrackdetectorassembly[11].Qiaojian-haupproposedasystemthattakesthelinearchargedcouple device(CCD) as a image sensor, processes theimagesignalcollected, judgesoutthecracksignal. DisplaythecurvethroughLCDandgivesoffalarm. [12].K.Vijayakumaret.alhasinvestigatedcrack detection using microwave sensors. It describeshow a Microwave horn antenna can be used to detectthe crack in a rail track [13]. Richard J. Greene et. alhave presented a new crack detection method for railwhich utilizes the change in infrared emission of therail surface during the passage of the train wheel [14].Wehaveproposednewmethodwhichutilizescomponentsinclusiveofa GPSmodule,GSMmodem, IR sensors for the prevention of accidentswhicharecausedduetolevelcrossingandderailmentduetocrackintherailwaytrack.

III.PROPOSEDSYSTEMWORKING

Automatic railway control system is made up of sensors.it sense the train track and closed the gate correct time.Replacing man power is very safe against accident.By using transmitter and receiver we can control the railway gate system.Once the train leaves the station ,the station mastation master informs the gatekeeper about the arrival of the train through the telephone.

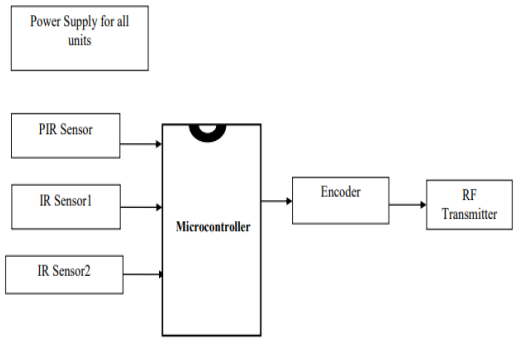


A.Unmannedgatecrossingcontrollersystem

Unmanned gate crossingcontroller system used FMcommunication system. It has one arrival point at 3km distance on one side and one departure point at3km distance for train from the level crossing. At thelevel crossing, proposed system have microcontrollerforreceivingthesignalfromsensorsandasperreceivingsignalopeningandclosingofgateareperformed.Whentraincomesatarrivalpointi.eArriv

al IR sensor, sensor sense the arrival of thetrain and send signal at the level crossing and at thesametimeclosingofthegateareperformed.Similarlywhentraingoesatdeparturepointi.eDepartureIRsensor,IRsensor sensethedepartureof the train and send signal at the level crossing andopeningofthegate performed.

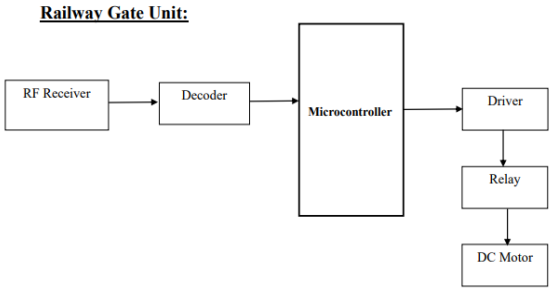
Railway Track Unit:



B .Crackdetectionsystem

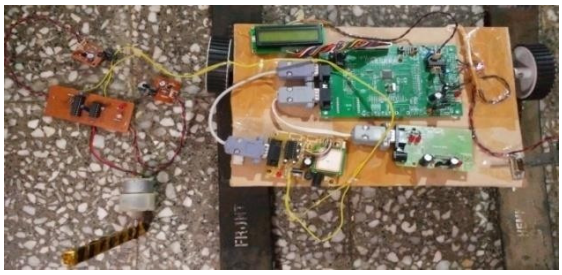
In the Crack detection system, Before the start of therailway line scan the robot has been programmed toself calibrate the IR transmitter and receiver. Aftercalibration,therobotwaitforthepredeterminedperiod of time so that the GPS module start readingthecorrectgeographiccoordinate.Theprincipleinvolved in this crack detection is that light reachingthe IR receiver is proportional to the intensity of thecrack. Both IR transmitter and receiver will be placedstraightlinetoeachotheronrail.Duringoperation,when the light from the transmitter does not fall onreceiver so that it gives resultNO Crack found. Andwhen light from the transmitter fall on receiveri.elightdeviatesfromthepathduetocrackintherailway trackthen it gives result as a crack found. Inorder to detect current location of the train in case ofdetection of crack ,we have used GPS receiver whosefunctionistoreceivethecurrentlatitudeandlongitude data. And this latitude and longitude datewill be send by GSM modem to IOT website.Wehavemanagedthiscrackdetectionsystemusinginternet of thingstechnology .On IOTwebsitewewill get information about train in terms of train no.lat,long, crack YESor NO anddate.

Railway Gate Unit:



RESULTS AND DISCUSSION

ThecomponentareassembledandprogramwasburnedinATMEGA 328microcontroller.Fortestingpurpose we used stepper motor to get pulley up downat the level crossing in the unmanned gate crossingcontroller system and crack detection was managedandmonitoredbyIOT.ForthatWeintroducedxammpserver.XammpserverisintegratedwithMysql and PHP. Theprogram is doneusing PHPlanguage.PHPisscriptinglanguageandMysqlis open source database. we have used Mysql to storeandmanagethedataandwehaveaccessedthedatabaseusinghostedwebsite(IOT).Incrackdetectionsystemweusedaluminiumframefortesting purpose kept in the form of track and modelwas made to travel through it. We included breakmanually and found that device successfully detectedthatusercreatedcrackandcurrentlatitudeandlongitudevaluesweresentbytheGPSmodule.



Assembly of proposed systems

CONCLUSION

This system proposed has been a very reliable one.We can prevent heavy loss of life using internet ofthings technology and IR sensor based system.

Theproposedunmannedrailwaygatecrossingsystem perform automatic opening and closing gate functionwithout help of human participation and also railwaytrackbrokensystemautomaticallydetectsfaultyrailway track without human intervention. There aremanyadvantageswiththeproposedsystemwhencompared with the traditional system. The

advantageincludelesscost,lowpower,highaccuracy, lowpowerconsumption,lessanalysistimeandmaina dvantages in crack detection is that we can centrallymanagethissystemusinginternetofthingste chnology and we can find the exact location of thefaulty track using hosted website (IOT) so that manylivescanbe saved.

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