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Development of Vision-Based Sensor of Smart Robot for Industrial Applications

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Abstract - Robotic manipulators are widely used to replace human operators in tasks that are repetitive in nature. However, there are many tasks that are non-repetitive, unpredictable, or hazardous to thehuman operators. Clear in gupanu clear power plant leak or exploring the extreme depths of ocean are just some examples. The most developed robot in practical use to day is the roboticarmandit is seen in applications throughout the world. Robotic are used to carryout working outer space where man can not survive and also used to do work in them edicalfieldsuch asconducting experiments without exposingthe researcher.

In early days, robotic manipulators have been implemented in different control techniques like mechanical control and the remote control or tele-opertation. Butwiththe adventofhighperformance,anew wayofcontrol usingmobilehasbeen implementedwhichisintroducedinthisproject.

All theabovesystemsarecontrolledby the Microcontroller.In ourprojectweareusing thepopular8bitmicrocontrollerAT89S52. It's a 40 pinmicrocontroller. TheMicrocontrollerAT89S52is usedto control thedcmotors.TwoDCmotorsare usedtodrive the robotinfrontdirectioni.e. Front Therobotis alsodevelopedtogivean alertwhenanyfireaccidents occursandto givealert.Here we areusingfire sensorand IR-pairs foralteringfiresensors andfor obstacledetectionalso.

IndexTerms- Mobilerobots, Navigation, Robotvisionsystems, Intelligentrobots, Learningsystems, Cooperativesystems.

I INTRODUCTION

Task specification in autonomous robotics has received an increasing interest. It is today admitted that autonomous mobile robots should be designed with a minimal prior knowledge on the tasks to perform so that the robot can adapt to unpredictable situations characterizing the dynamical nature of real environments. The robots should also constitute their skills via interactions with their physical and social environment where they build up experiences from their sensory-motor interactions leading their own cognition to enact a subjective world, also called the Umwelt. In this context, Human-Robot Interactions (HRI) are thought to be a very efficient means to specify some various tasks to a robot and to catalyze its sensory-motor learning. HRI are moreover a key point for designing operational or social and interactive robot. This paper investigates the use of HRI for the learning of navigation tasks. This paper first presents our robots and its visual system enabling to create a continuous state space. Then, we will propose a bootstrap for the PerAc architecture that enables the semi-supervised learning of a sensory-motor behavior (a visual path, a homing behavior).

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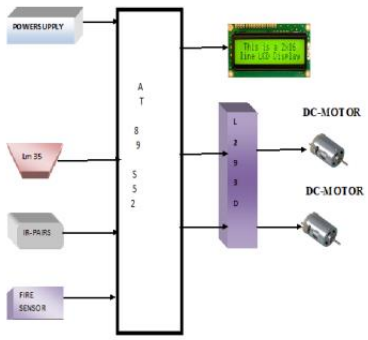
The couple architecture- equations enables to adapt the partitioning of the environment to the complexity of the task. The system does not separate learning and performing phases, which are scattered in time according to the rhythm of the interaction. The system will be evaluated in a real indoor environment by means of accuracy measures between the performed trajectory and the expected behavioral attractor of the robot dynamics.

BLOCKDIAGRAM:



II MICROCONTROLLER

Microcontrollersare "embedded" inside someotherdevice (oftenaconsumer product)sothattheycancontrolthe featuresor actionsofthe product.Anothernamefora microcontroller,therefore,is "embedded controller".Microcontrollersare dedicatedtoone taskandrunonespecificprogram.The program isstored in ROM(read-only memory) and generallydoesnotchange.
Microcontrollersare oftenlow-power devicesandhasa dedicatedinputdeviceand often (butnotalways)hasasmallLEDorLCD displayforoutput.A microcontrolleralso takes inputfromthe device itis controlling and controls the device by sending signals to differentcomponentsinthedevice.
For example, the microcontroller insideaTVtakesinputfrom theremotecontrolanddisplaysoutputonthe TV screen.The controllercontrolsthe channelselector,the speakersystem andcertainadjustmentsonthe picturetubeelectronicssuchas tintand brightness. The engine controllerinacartakes inputfromsensorssuch astheoxygen and knocksensorsandcontrolsthingslike fuelmix and spark plug timing.Amicrowaveovencontrollertakesinputfromakeypad,di splaysoutputonanLCD displayandcontrolsarelay thatturnsthe microwave generatoronandoff.A micro controller soft ensmalland low cost.The componentsarechosentominimizesizeandto beasinexpensiveaspossible.

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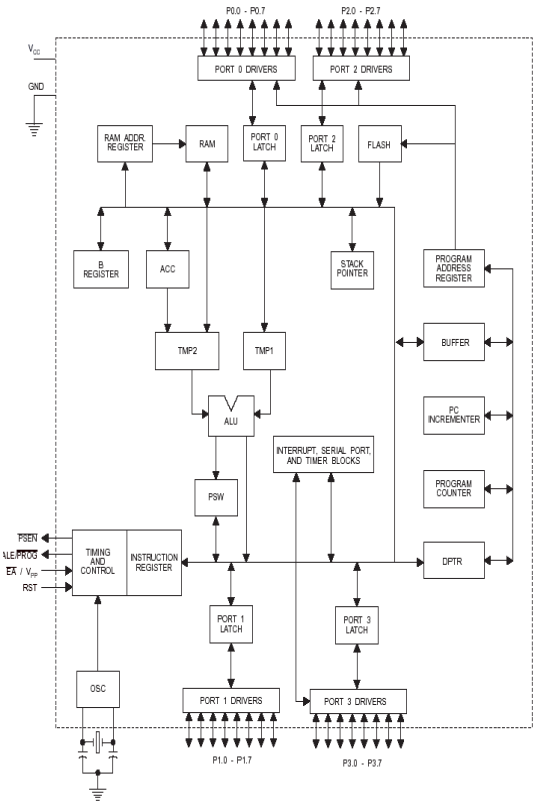
A microcontrollerisoften,butnotalways, ruggedizedinsomeway. The microcontroller controlling a car'sengine, forexample,has to work in temperatureextremesthatanormal computer generallycannothandle.A car'smicrocontroller inAlaskahastoworkfinein-30degreeF(-34C)weather,whilethesamemicrocontrollerinNevadamightbe operatingat120degreesF(49C).Whenyouaddtheheatnaturally generated bytheengine,thetemperaturecangoashighas150or180degrees F(65-80C)in theengine compartment.On theotherhand,a microcontrollerembeddedinside aVCRhasn't been ruggedized at all. The actual processor usedtoimplement amicrocontrollercanvary widely.

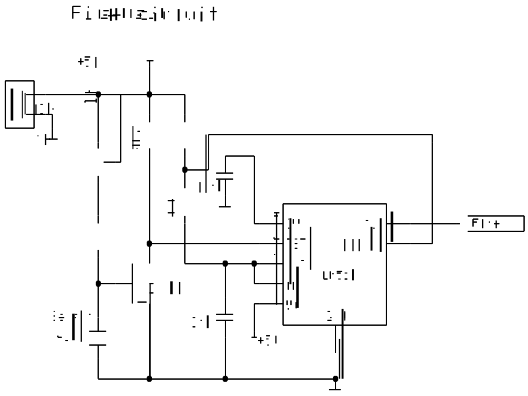
TheIntel8051is Harvard architecture, single chipmicrocontroller(µC)whichwasdeveloped by Intelin1980 foruseinembeddedsystems.

Theofficialdesignationforthe8051 family is MCS 51. Intel's original versions were popularinthe 1980s andearly1990s,buthas todaylargelybeensupersededbyavastrangeof fasterand/orfunctionallyenhanced 8051-compatibledevicesmanufacturedbymorethan 20 independent manufacturers includingAtmel,InfineonTechnologies(formerlySiemens AG),Maxim Integrated Products(via itsDallas Semiconductorsubsidiary),NXP(formerlyPhilips Semiconductor), Nuvoton(formerlyWinbond),ST Microelectronics, SiliconLaboratories (formerly Cygnal),Texas Instruments andCypress Semiconductor.

Intel's original 8051 family was developed using NMOS Technology,butlaterversions,identifiedby a letter C in their name (e.g., 80C51) usedCMOS technology and werelesspower-hungry than theirNMOS predecessors.This madethemmore suitableforbattery-powered devices.



III FIRESENSORCIRCUIT



IV TEMPERATURESENSOR(LM35)

Precision Centigrade Temperature Sensor:

In this project, in order to monitor the temperature continuouslyandcompare thiswith the settemperature preprogrammedinthe microcontroller,initiallythistemperature value hastobereadandfedtothemicrocontroller. Thistemperature value hastobe sensed.Thusa sensorhastobe usedandthe sensorusedinthis projectisLM35.Itconvertstemperature value intoelectricalsignals.

LM35seriessensorsare precisionintegrated-circuittemperature sensorswhose outputvoltage is linearlyproportional totheCelsius temperature.The LM35requiresnoexternal calibrationsince itisinternallycalibrated..The LM35doesnotrequireanyexternalcalibration or trimmingtoprovidetypical accuracies of±1⁄4°Catroomtemperatureand±3⁄4°Coverafull−55to+150° Ctemperaturerange.

The LM35's low output impedance, linear output,andprecise inherentcalibrationmake interfacing to readoutorcontrolcircuitry especiallyeasy.Itcanbe usedwithsingle power supplies,orwith plusandminussupplies.Asit drawsonly60µAfromitssupply,ithasvery low self-heating,lessthan0.1°Cin stillair.

V WHATIS INFRARED

Infrared isanenergy radiation with afrequency beloweyessensitivity,sowe cannotsee it.Eventhatwe cannot"see"soundfrequencies, weknowthatitexist,wecanlistenthem.

Eventhatwecannotseeorhearinfrared,we can feelit at ourskintemperature sensors. Whenyouapproachyourhandtofire orwarm element,youwill"feel"theheat,butyoucan't see it.Youcansee the fire because itemitsother typesofradiation,visibletoyoureyes,butit

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alsoemitslotsofinfraredthatyoucanonlyfeel inyourskin.

VI INFRARED IN ELECTRONICS

Infra-Redisinteresting,because itiseasily generated and doesn'tsufferelectromagnetic interference,so itisnicely used to communication and control,butitisnotperfect, some other light emissions could contains infraredaswell,andthatcaninterfere inthis communication.The sunisanexample,since it emitsawidespectrumorradiation.

The adventure ofusinglotsofinfra-redin TV/VCRremote controlsandotherapplications, broughtinfra-reddiodes(emitterandreceivers) atverylowcostatthemarket.

Fromnowonyoushouldthinkasinfraredas just a "red" light. This light can means somethingtothe receiver,the "onoroff" radiation cantransmitdifferentmeanings. Lotsof things can generate infrared, anything that radiateheat doit, includingout body, lamps, stove,oven,frictionyourhandstogether,even thehotwateratthefaucet.

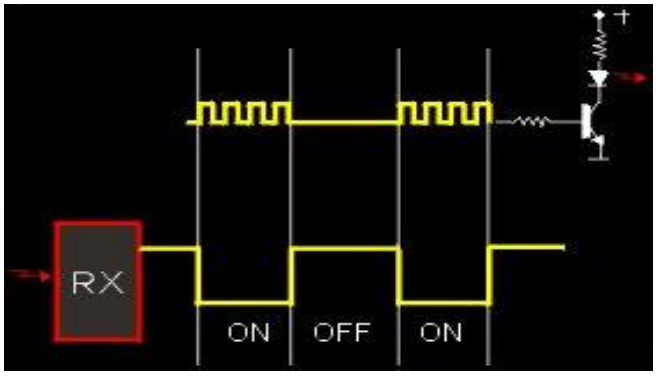
To allowagoodcommunicationusinginfra-red, andavoidthose "fake"signals,itisimperativeto use a"key"thatcantellthe receiverwhatisthe realdatatransmittedandwhatisfake. Asan analogy,lookingeye nakedtothe nightskyyou can see hundreds ofstars, butyoucanspoteasilyafarawayairplane justbyitsflashing strobelight. Thatstrobe lightisthe"key",the "coding"elementthatalertsus.

Similartothe airplane atthe nightsky,our TV roommayhavehundredsoftinnyIRsources, ourbody,and thelampsaround,eventhe hotcupof tea. Awaytoavoidallthose othersources,is generatingakey,like the flashingairplane.So, remote controlsuse topulsateitsinfraredina certainfrequency. TheIRreceiver moduleat the TV,VCRorstereo"tunes"tothiscertain frequencyandignores allotherIR received. The best frequencyforthejob is between30and 60 kHz,themostusedis around36 kHz.

VII IRGENERATION

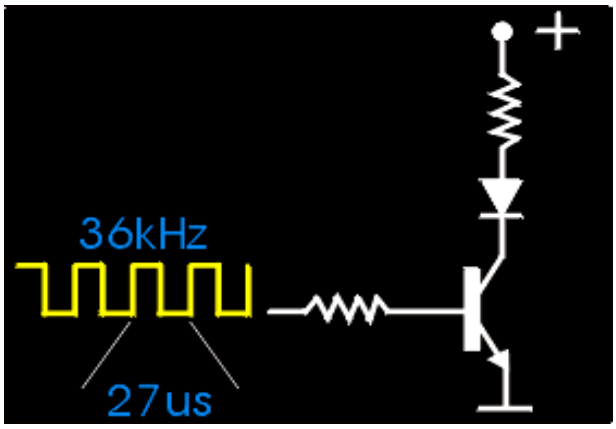
To generate 36 kHzpulsatinginfraredisquiteeasy,moredifficultistoreceive and identify thisfrequency. Thisiswhy some companiesproduceinfrared receives,that containsthe filters,decodingcircuitsandthe outputshaper,thatdeliversasquare wave, meaning theexistenceornotofthe36kHz incomingpulsatinginfrared.

It means that those3 dollars small units, have anoutputpinthatgoeshigh(+5V)when there isapulsating36kHzinfraredinfrontofit, andzerovoltswhenthere isnotthis radiation.Asquare waveofapproximately27uS (microseconds) injected at the base of a transistor,candrive aninfraredLEDtotransmit thispulsating lightwave. Upon itspresence,the commercialreceiver willswitch its output to high level(+5V).Ifyoucan turn on and offthis frequency atthetransmitter,yourreceiver's outputwillindicatewhenthetransmitteris on or off.



Those IRdemodulatorshaveinvertedlogicatits output,when aburstofIRissensed itdrivesits outputtolowlevel,meaninglogic level=1.

The TV,VCR,andAudioequipment manufacturersforlonguse infra-redattheir remote controls. To avoid aPhilips remote controltochange channelsinaPanasonicTV, theyusedifferent codificationat theinfrared, eventhat allofthemuse basicallythe same transmittedfrequency,from36to50kHz. So, allofthemuseadifferentcombinationofbits orhowtocode thetransmitteddata toavoid interference.



VIII ABOUTSOFTWARE

Ourprojectscompletedon schedule. Keildevelopment tools for the 8051 MicrocontrollerArchitecture supporteverylevel ofsoftwaredeveloperfrom theprofessional applicationsengineertothestudentjustlearningabout embedded software development. The industry-standard KeilCCompilers,Macro Assemblers,Debuggers,Real-time Kernels, Single-board Computers,and Emulatorssupport all8051derivatives andhelpyouget.

IX SIMULATION

TheµVisionSimulatorallowsyouto debug programsusingonlyyourPCusing simulation driversprovided by Keiland various third-party developers.Agood simulation environment,likeµVision,doesmuchmorethan simplysimulate the instructionsetofa microcontroller—itsimulatesyourentire target system includinginterrupts,startupcode,on- chip peripherals,external signals,and I/O.This software isusedforexecutionofmicrocontroller

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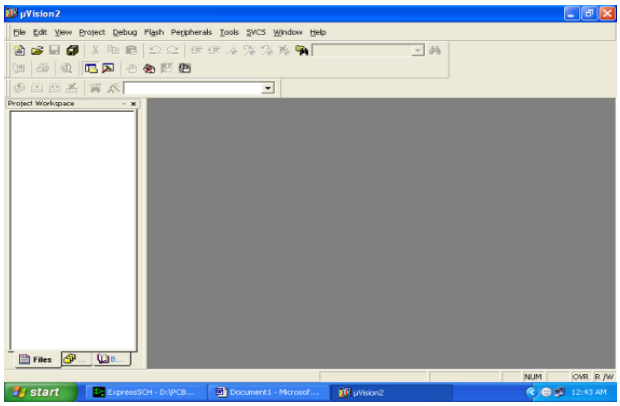
programs.Keildevelopmenttoolsforthe MC architecturesupport every level of software developerfrom the professional applications engineerto the studentjustlearning about embeddedsoftware development.The industry- standard keilCcompilers,macro assemblers, debuggers,real,time Kernels,Single-board computersandemulatorssupport all microcontrollerderivativesand helpyouto get more projectscompletedonschedule.Thekeilsoftware development tools are designed to solvethecomplex problems facing embedded softwaredevelopers.

When startinganew project,simply select the microcontroller you the device databaseandthe µvisionIDEsets allcompiler, assembler,linker,andmemory optionsforyou. Numerous example programs are included to helpyougetstarted with themostpopular embedded AVRdevices.ThekeilµVision debugger accurately simulates on-chip peripherals (PC,CAN,UART,SPI,Interrupts,I/Oports,A/D converter,D/AconverterandPWMmodules)of your AVRdevice. Simulation helps you understandh/wconfigurationsandavoidstime wasted on setup problems. Additionally, with simulation,youcanwriteandtestapplications beforetargeth/wis available.

Whenyou arereadytobegintestingyour s/wapplicationwithtargeth/w,use the MON51, MON390,MONADI,orflash MON51target monitors,theISD51In-System Debugger,or theULINKUSB-JTAG adaptertodownload andtestprogramcodeonyourtargetsystem

Click on theKeiluVisionIcon onDesktop

Thefollowing figwillappear:



X CONCLUSION

In early days, robotic manipulators havebeenimplementedin differentcontrol techniqueslikemechanical control andtheremotecontrol orTele-operations.Butwiththeadventof high performance,anewway of roboticcontrol withdetectionof anobstacle,fireand temperaturevaluescan alsobesuccessfully detected.

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AUTHOR PROFILE

D Vijaya Bhavani has done B.Tech in Pragati Engineering College in Electronic & Communication Engineering and now currently pursuing Masters of Technology in RRS College of Engineering and Technology in Embedded Systems.

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