Humanoid Robot

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Abstract

Robot programming has always been a central topic in industrial robotics as well as in robotics research. Classical teaching is still wide-spread and with many robots the programmers still press buttons for left, fight, up, down etc. Off-line programming does not solve this problem, as in the 3D-graphics world , too, one has to move the robot somewhere in 6 degrees of freedom. On the other hand more than 50 programming languages have been developed without yielding a real breakthrough. Thus after more than 25 years in robotics research we are fairly sure that learning by showing and/or direct guidance and intuitive interaction remains one of the most promising techniques in robot programming. If we are talking about service and human friendly robots, intuitive interaction is the key issue. It seems that there are three major alternatives for intuitive man-robot interaction: voice; human hand; and human face. It is outlined in which way these techniques so far have entered the programming of industrial robots but especially the remote control of space and surgical robots.

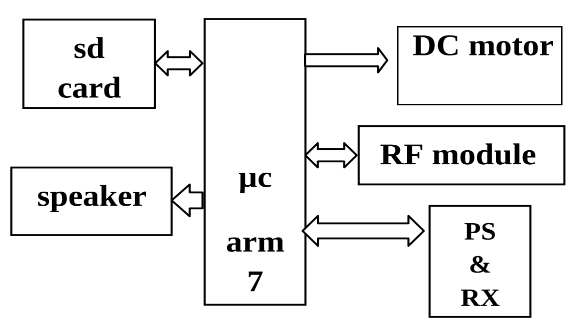
In our project we are attaching 1 accelerometer to the hand which will detect the ARM's position in Forward, Reverse, left, right, grab, release etc.

Introduction

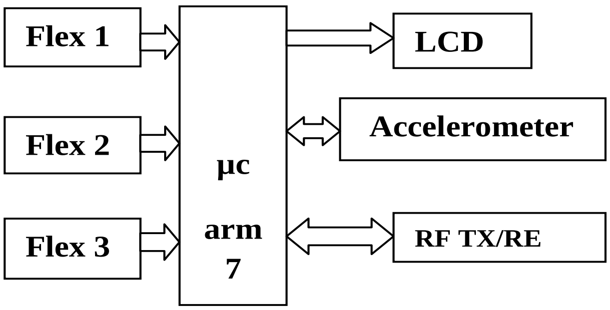
A humanoid robot is a robot with its body shape built to resemble that of the human body. A humanoid design might be for functional puposes,such as interacting with human tools and environments, for experimental purposes, such as the locomotive motion, or for other purposes. In general, humanoid robots have a torso, a head, two arms, and two legs, though some forms of humanoid robots may model only part of the body, for example, from the waist up. Some humanoid robots may also have heads designed to replicate human facial features such as eyes and mouths.

Block Diagram

Robot Unit



Handheld Unit



Block Diagram Explanation

1. Handheld unit
2. Robot Unit

Handheld unit:

Here the handheld device has 2 accelerometers which give us Linear acceleration inX,Yand Z directions. Using the accelerometer the handheld device will decode the hand gestures in 3D space. Using the look up table in µC we can decode the exact gesture done by the user like stop, Start, Forward, Reverse, Left and Right pick and Place etc. . . Also we are using Flex sensor to decode some sign used in sign language. The µC will decode the symbols using variable resistance .The handheld unit will then send the decoded gestures to the robot unit using wireless RF module.

Robot unit:

As shownin the diagram we are making a robotwhich resembles a humanoid robot.
Here the µC will receive the commands sent by the Hand held unit via RF receiver. The µC will thendecodethese symbolsand run the DC motors accordingly. We haveinterfaced 2 DC motors separately for ROBO buggywhich will move the robot Forward, Reverse, Left and Right pick and Place etc. Also the Robot unit is interface with an SD card which will store the .wav files. It will interact with the user by playing these .wav files in response to the gestures made by the user.

Specifications

MICROPROCESSOR LPC 2138

16/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 or HVQFN package.8/16/32 kB of on-chip static RAM and 32/64/128/256/512 kB of on-chip flash program memory.128-bit wide interface/accelerator enables high-speed 60 MHz operation.In-SystemProgramming/In-pplication Programming (ISP/IAP) via on-chip bootloadersoftwareSingle flash sector or full chip erase in 400 ms and programming of 256 B in 1 ms.Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the On-chip Real Monitor software and high-speed tracing of instruction execution. 8-channel 10-bit ADCs provide a total of up to 16 analog inputs, with conversion times as low as 2.44 ms per channel.Single 10-bit DAC provides variable analog output.Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.Low power Real-time clock with independent power and dedicated 32 kHz clock input.Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus (400 kbit/s),SPI and SSP with buffering and variable data length capabilities.On-chip integrated oscillator operates with external crystal in range of 1 MHz to 30 MHz and with external oscillator up to 50 MHz.Power saving modes include Idle and Power-down.CPU operating voltage range of 3.0 V to 3.6 V (3.3 V ± 10 %) with 5 V tolerant I/O pads.**LCD :-** Lampex16*2, Backlite Facility,
100mAmp Consumption**RS 232 PROTOCOL**
Is used for serial communication in between µc to PC.In our project the master is connected to the PC via RS--232.**BAUD RATE:**9600 BPS, Timer Mode 1Autoreload Mode **RF Communication**Ghz, 30 meters , RF Transreceiver**DC motor driver:**L293D, 2 DC motor interface**DC motor:**12v , Bidirectional , 2 Kg torque**Accelerometer:**ADXL335, 3.3V, X,Y and Z direction

Applications

Because the capabilities of humanoid robots are rather limited,there are few real-world applications for them so far. The mostvisible use of humanoid robots is technology demonstration.

Technology Demonstration

Famous humanoid robots like the Honda Asimo [32] or the ToyotaPartner Robots [33] do not accomplish any useful work.They are, however, presented to the media and demonstratetheir capabilities like walking, running, climbing stairs, playingmusical instruments or conducting orchestras on stage and duringexhibitions. Such a showcase of corporate technology attractspublic attention and strengthens the brand of the carmanufacturers. Hence, the huge development costs of theseadvanced humanoids might be covered from the marketing budgets.

Space Missions

Another area where money is not much of an issue is missionsto space. Since human life support in space is costly and spacemissions are dangerous, there is a need to complement or replacehumans in space by human-like robots. The two prominentprojects in this area are the NASA Robonaut [9] and DLR'sJustin [23]. Both use a humanoid torso mounted on a wheeledbase. The humanoid appearance of the robots is justi_ed, because
they can keep using space-certi_ed tools which have beendesigned for humans and because the humanoid body makesteleoperation by humans easier.

Household

An obvious domain for the use of humanoid robots is the household.Some humanoid projects explicitly address this domain.They include the Armar [35] series of robots developed in Karlsruhe,Twendy-One developed at Waseda University, and the personalrobot PR1 [10] developed in Stanford. While these robotsdemonstrate impressive isolated skills needed in a household environment,they are far from autonomous operation in an unmodified household.

Robot Competitions

A currently more viable application for humanoid robots is robotcompetitions. RoboCup and FIRA, for example, feature competitionsfor humanoid soccer robots. These robots are fully autonomousand play together as a team. When they fall, theyget up by themselves and continue playing. The participatingresearch groups either construct their own robots or they usecommercial humanoid robot kits available, e.g., from Robotis
and Kondo. RoboCup also selected the AldebaranNao humanoidrobot as successor of the Sony Aibo in the StandardPlatform League. Another popular competition for humanoidrobots is Robo-One, where teleoperated robots engage in martialarts. There are also competitions for robots in humanpopulatedenvironments like the AAAI mobile robot competition,where the robots are supposed to attend a conference, andRoboCup@home where the robots are supposed to do usefulwork in a home environment. Because they provide a standardized
test bed, such robot competitions serve as benchmark forAI and robotics.

Future Scope

It is expected that humanoids will change the way we interact with machines, and will have the ability to blend perfectly into an environment already designed for humans. Our aim is to discover the future abilities of humanoid robots by presenting a variety of integrated research in various scientific and engineering fields, such as locomotion, perception, adaptive behaviour, human robot interaction, neuro science and machine learning.

Conclusion

We propose remote-controlled humanoid robots that cooperate and act in symbiosis with humans and help them, a remote monitor system and a work assist robot useful in a disaster or an accident in particular. We will further improve the remote control system **so** that a virtual presence closer to actual presence can be formed through more intensive fusion of robot operation and visual and audio information in the virtual manipulation space. In parallel with these efforts, we will achievemore delicate tasks of enhancement of operability byhardware and improvement of reliability of the communication system. It is currently obvious that this robot is required in the market. We are absolutely determined to proceed with further research and development efforts to commercialize the robot **as** soonas possible. The result of research and development activities onhumanoid robots is announced on a large scale one afteranother recently. Each of these events **is** highlighteddramatically. Humanoid robotics is undoubtedly a new,indispensable industIy in the 21st century. Under thesecircumstances, the authors sincerely hope that theirresearch efforts will contribute to the development ofrobots

References

(1) H.Inou

'Humanoid Robotics Project of MITI'
The first JEEE-RAS Int. Cod. Boston, 2000

(2) S. Tachi
'Real-time remote robotics'
Telexistence, EEE Computer graphics and
Applications, 1998

(3) H. Inoue, H. Himkawa
'Humanoid Robotics Project of MITI',
Journal of the Robotics Society of Japan,
2001

(4) www.atmel.com

(5) www.nationalsemiconductors.com

(6) www.dallassemi.com