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Robotics in Societal Environment: An opportunity for evolution of mankind

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ABSTRACT: *This paper is the representation of the idea of robots in the human societal environment. This article describes the concept of humanoids in our societal environment. In this paper some limitations regarding the concept of robots in society of humans are listed. This paper also contains some ideas and ways to develop a great environment with combination of humans and robots. It also describes a concept of self programming or learn and remember method. This article represents the criteria of focusing on the Research and Development needed for the future, the future with the acceptance of robots in society for the betterment of human race. This paper provides the enlightenment of the opportunity for people to overcome the limitations and move towards the development of great interaction between machine and human for society on daily basis. This article emphasizes on finding the ways to enhance the relationship between the robots and humans for the endowment to mankind. This paper also contains the example of some robots like ASIMO to better understand the functioning of humanoids robots.*

KEYWORDS: Humanoid, ASIMO, Self Programming Methods.

1. INTRODUCTION

A new field of robotics is emerging. Robots are today moving towards applications beyond the structured environment of a manufacturing plant. They are making their way into the everyday world that people inhabit – hospitals, offices, homes, construction sites and other cluttered and uncontrolled environments. The field of robotics is evolving day by day, but has not reached the state to develop humanoids for our daily human environment. In today's time robots are the key element in the field of industries and production unit. But the question arises -is it enough? , can we do something else with it? There can be another vision about this branch, the vision that provides more options. The humanoids can perform the tasks similar to humans, but they lack to reach the common purposes of society. The successful introduction of robotics into human environments will rely on the development of competent and practical systems that are dependable, safe, and easy to use. But first we need to draw our attention to the research over the solutions to provide more compatibility between human and bots.

The introduction of a robot to assist a human in certain tasks will reduce fatigue, increase precision, and improve quality; whereas the human can bring experience, global knowledge, and understanding to the execution of task.

Robots can be imagined as mechanical workers, to help us in our daily life. Research on manipulation in human environments may someday lead to robots that work alongside us, extending the time an elderly person can live at home, providing physical assistance to a worker on an assembly line, or helping with household chores.

2. HUMAN SOCIETAL ENVIRONMENTS

Human social environments encompass the immediate physical surroundings, social relationships, and cultural milieus with in which defined groups of people function and interact. Components of the social environment include built infrastructure; industrial and occupational structure; labor markets; social and economic processes; wealth; social, human, and health services; power relations; government; race relations; social inequality; cultural practices; the arts; religious institutions and practices; and beliefs about place and community.

Important characteristics of human social systems are population size, social organization, values, technology, wealth, education, knowledge and many more. Especially values and knowledge strongly influence peoples "view of life" and consequently define the way people act. The choice of possible actions is then limited by the available technology. Human environments have a number of challenging

characteristics that will usually be beyond the control of the robot's creator. The following list briefly describes some of these characteristics.

◆ **People are present**

Users who are not familiar about robotics may be in the same environment and possibly close to the robot.

◆ **Built-for-human environments**

Environments and objects will usually be well-matched to human bodies and capabilities.

◆ **The Other autonomous actors are present**

For example, pets and other robots may be nearby.

◆ **Dynamic variation**

The world can change without the robot taking action.

◆ **Real-time constraints**

In order to interact with people and match the dynamics of the world, the robot must meet real-time constraints.

3. A CONCEPT OF BOTS IN SECURITY PURPOSES OF SOCIETY

Over the past two years, as the use of "war bots" (also called robotic weapons, drones, unmanned combat vehicles [UCVs], or unmanned aerial vehicles [UAVs]) has increased and become visible in combat zones including Iraq, Pakistan, and Afghanistan, a scholarly literature has emerged analyzing the legal implications of these weapons. These kinds of war bots are providing a higher security to the humans in war. Thus man has achieved a great reliability on robots in combat field and it can also be followed by success in living environment.

The concept of practical implementation of robots at the city level may not seem to be clear today. But we can think of robots programmed as POLICE-BOTS; or robots in fire-fighting team; or robots for patrolling etc. A clear thing about robot we can say is that they cannot perform any non feasible activity for society during their functioning until their programming is altered. A policeman has options for taking BRIBE, but a robot has no quality of GREED. Hence robots programmed for police service can perform more efficient job. A limitation of robot is that it does not have autonomy like human brain; its functioning can be changed by humans. Thus they alone cannot provide a proper work. There may come a time when need may arise of a manual guidance. So we need to emphasize on combination of both.

Within controlled environments, the world can be adapted to match the capabilities of the robot. Formation of the controlled environment requires a co-ordination between man and machines.

The system can be developed with a central control system at the town to control the police bots at the different areas. This way the humans and bots can provide more security for the town by working together. The robots should be provided the sanction to work by them self but under the controlled condition of human guidance whenever needed. Police-bots should be allowed to work without continuous supervision of man but at times should contact the control system when exception occurs. Outside of controlled settings, robots only perform sophisticated manipulation tasks when operated by a human. Thus it also becomes less effective with only humans. So the need arises of introducing a system that can provide a brain to the robots and that can work as prototype of human and can be controlled by humans when needed.

4. HUMANS AND ROBOTS TOGETHER

Humans and robots can also work together while in the same physical space. Human environments tend to be occupied by humans, so robots have the opportunity to benefit from human assistance. For example, the initial version of the commercially successful Roomba relies on a person to occasionally prepare the environment, rescue it when it is stuck, and direct it to spots for cleaning and power. The robot and the person effectively vacuum the floor as a team, with the person's involvement reduced to a few infrequent tasks that are beyond the capabilities of the robot. Researchers have looked at techniques for cooperative manipulation that physically couple a robot and a human. For example, humans and robots have carried objects together, and robot arms have helped guide human actions by resisting undesirable motions. Robots can also use social cues and physical cues to make cooperative manipulation more intuitive. Through eye contact, a vocal utterance, or a simple gesture of the hand, a robot may indicate that it needs help with some part of a task.

A. safety

Robots that work with people must be safe. Traditional industrial manipulators are dangerous, so people are usually prohibited from being in a robot's workspace when it is in motion. Injury commonly occurs through unexpected physical contact, where forces are exerted through impact, pinching, and crushing. Of these, impact forces are typically the most dangerous, depending on the velocity, the mass and the compliance of the manipulator.

The way to increase security is to provide more and more accuracy to the software. The software can be made more dynamic and real time to re-act the real time situations rather than just depending on anticipation.

Commercially available arms such as the Manus arm. The Manus arm incorporates several safety mechanisms, including current limits for the motors and slip-couplings that limit impact forces.

B. control

Within perfectly modelled worlds, motion planning systems perform extremely well. Once the uncertainties of dynamic human environments are included, alternative methods for control become important. For example, control schemes must have real-time capabilities in order to reject disturbances from unpredicted collisions and adapt to changes in the environment, such as might be caused by a human collaborator. Many researchers are looking at ways to extend planning methods so that they will perform

well under these circumstances, including O. Brock's group at UMass Amherst and researchers at the University of North Carolina, Chapel Hill, Carnegie Mellon University, the University of Illinois at Urbana-Champaign, and Stanford.

Control is the most vital portion of robotics where everything is dependent on creator. For this limitation a new system can be introduced that can provide both self learning and that system should also be combined with the human control and programming.

C. Mobility and Manipulation

The ability to interact with the environment is an important capability for robotic systems; grabbing, lifting, pushing, and manipulating objects, while manoeuvring to reach, avoid collision, and navigate in the workspace. The control of the two functionalities, mobility and manipulation, must address both their complex kinematic coordination, and their strong dynamic interaction and coupling. Another critical aspect of mobile manipulation dynamics is the higher requirements manipulation tasks have on the robot responsiveness compared with those of mobility.

D. Neural networks

A neural network is a massive system of parallel distributed processing elements (neurons) connected in a graph topology.

The interest in neural network stems from the wish of understanding principles leading in some manner to the comprehension of the basic human brain functions, and to building the machines that are able to perform complex tasks. The neural network deals with cognitive tasks such as learning, adaptation, generalization and optimization. Indeed, recognition, learning, decision-making and action constitute the principal navigation problems. To solve these problems fuzzy logic and neural networks are used. They improve the learning and adaptation capabilities related to variations in the environment where information is qualitative, inaccurate, uncertain or incomplete. The processing of imprecise or noisy data by the neural networks is more efficient than classical techniques because neural networks are highly tolerant to noises.

E. Artificial Intelligence

AI textbooks define the field as "the study and design of intelligent agents" where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success. John McCarthy, who coined the term in 1955, defines it as "the science and engineering of making intelligent machines."

Recent efforts in AI have begun to examine more generalized applications. Two important ones are machines that can learn from their environment and machines that interact well with people. The new field of affective computing has developed as a result of these endeavours, and it has been fuelled by recent findings that emotions play an essential role in rational thought in humans.

The best example of the artificial intelligence is ASIMO, NASA- space exploration. ASIMO is the first humanoid robot by HONDA. It has got extremely extraordinary abilities to perform the functions of man. ASIMO has the ability to recognize moving objects, postures, gestures, its surrounding environment, sounds and faces, which enables it to interact with humans. The robot can detect the movements of multiple objects by using visual information captured by two camera "eyes" in its head and also determine distance and direction. This feature allows ASIMO to follow a person, or face him or her when approached. The robot interprets voice commands and human hand movements, enabling it to recognize when hands shake is offered or when a person waves or points, and then respond accordingly. ASIMO's ability to distinguish between voices and other sounds allows it to identify its companions. ASIMO is able to respond to its name and recognizes sounds associated with a falling object or collision. This allows the robot to face a person when spoken to or look towards a sound. ASIMO responds to questions by nodding or providing a verbal answer and can recognize approximately 10 different faces and address them by name.

Fig.1 ASIMO conducting pose

5. LIMITATIONS

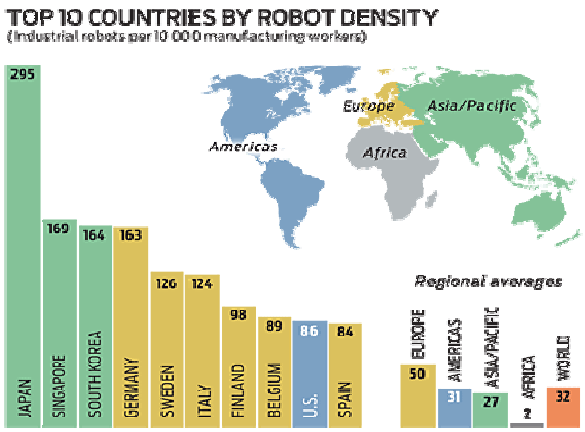

Fig.2 Industrial Robot usage Density

The above figure shoes the number of the density of the robots used in industries per 10,000 workers. It

is clear from the graph that some areas of the world still less aware about the technology of robotics.
Although the technology has already evolved it has not reached to common societal environment due to certain factors which are as follows:-

- This type of robots has too complex structure and design.
- The expense is too high. Projects like ASIMO are made at cost of high amount of finance.
- The building of such machines requires high skills, and expert's vision. So it's not possible to implement at local level.
- Robotics branch is not that popular in some countries and thus concept of robots is not familiar to common people in some areas.

6. PERCEPTION AND AUTONOMY ONE OF THE MOST CHALLENGING PROBLEM

There are many problems related to this topic but the most popular problem is the problem of perception and autonomy. Robots lack the highly accurate perception as human beings.

The solution to this problem is self learning or self programming as shown in figure.

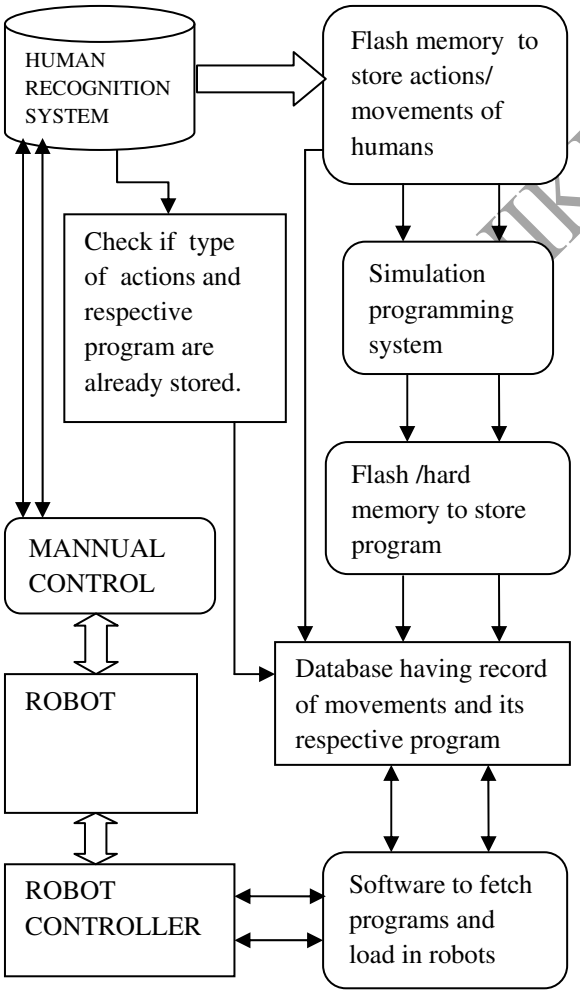

FIG.3 Block diagram of Concept of SELF PROGRAMMING METHOD

The kid of a human being always learns activities or actions by visualization or using the senses and remembers it. A baby learns basic activities for his/her parents by visualizing it and then implementing it for e.g. a kid hears speech of his/her mother and then tries to speak in that same manner. Thereafter he continues to learn new words and phrases. Thus we can also implement this method in robots; i.e. it listens, looks, feels and then stores the respective actions to be done for that situation, that it learns from human. After that whenever it is needed they are executed from the memory.

As shown in figure the concept of Self Programming is explained in the form of block diagram. The block diagram is shown which shows that a system can be thought of that can work on their own to program the robots.

First block contains the HUMAN RECOGNITION SYSTEM (HRS) which recognizes the human actions and connects to a memory device. The main function of HRS is to input the actions of the human in codes. It is also communicated to database for checking if the type of action and its respective code is already stored. If the action is new it is inputted to SIMULATION PROGRAMMING block. The SIMULATION PROGRAMMING SYSTEM generates the programming codes. It generates the code for that action and then the action and its respective code is stored in the database.

Software block is used to fetch the stored code for the action from the database and load to CONTROLLER. The controller executes the function according to the code and robot performs the action. Than the control is passed to MANNUAL CONTROL that checks the perfect learning of robot and the system's control is again headed to HRS (human recognition system).

This method is representing the concept of self programming that can provide the desired autonomy to robots. Besides other limitations the most important limitation of robot is brain. In this method robot learns and stores what it learns just like humans do.

So this is the basic need where the focus should be made. The man should draw attention to research and development of more acceptable architecture of AI.

7. CONCLUSION

My motive for developing this paper is that there is a great scope of enhancement in the field of robotics for social welfare.

The future is possible that will have robots like we have smart phones, computers etc. in our daily life. Robots can help for the evolution of mankind. There is some limitation that should be removed. I have represented one concept of SELF PROGRAMMING for solving the problem of perception and autonomy. I hope this will contribute to the research and development of the field of robotics.

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