The Brief Study on Emerging Trends in Robotic

[1]Abhijeet Nagaraj,[2]Karthik N

[1,2]Department of Mechanical Engineering, Faculty of Engineering and Technology

Jain (Deemed-to-be University), Bengaluru, India

Email: n.abhijeet@jainuniversity.ac.in

ABSTRACT:Robotics and artificial intelligence technology are disruptive innovation which provides significant growth opportunities and the potential to disrupt existing everyday economic and social aspects. The future has not yet been written and who knows whether or not robots are dangerous. What's certain is that people will create new generations of robots, being the curious beings. The concern for humanity has always been strong for robots and other high-level innovations. Most scientists have invested all their lives in their laboratories "to create creative strategies, to improve them and to build a highest quality robot." The technological drive that has taken place because of the efforts of a number of talented, consistent intellects of scientists around the world has brought this integration process to its height. The most striking dreams in this area have been successfully realized and a significant number of robots support the job or production process automatically. This happens so that in this lifetime people and robots go hand in hand, are compatible even in certain realms of life, and who knows what this opposition "Human and Robots" translates into. The future of the robots is pure conjecture, but the relentless advancements in technology are a foregoing inference, taking into account developments in recent years. Robots will certainly also affect different aspects of our lives and the implications for the human race will remain debated by scientists and philosophers. As the advancement of artificial intelligence progresses, robots may be superior to humans. Irrespective of the future, robots will be there.

KEYWORDS:Agricultural Robotics,Artificial Intelligence,Robotics,Trends.

INTRODUCTION

In 2013, 169,000 industrial robots were sold worldwide, which is up 13 percent compared to 2012, according to the International Federation of Robotics. Orders were significantly up in the first four months of 2014. The robot industry expects an increase in the current year. Rising production is mainly due to higher demand from Asian countries, where approximately 100,000 robots were deployed last year. After the introduction of industrial robots in the late 1960s, the gross cumulative sales amounted to around 2,632,000 by the end of 2013. The total life span of industrial robots is 12 years and the world's projected industrial robots are 1,600,000[1]. The highest robot density in the world hit South Korea-about 410 robots per 11,000 staff members.

The automotive industry remains the leading industrial robots' consumer. The share of total supply is almost 41%, and the automotive share is probably even higher, provided that statistical data from emergent countries are not complete. Robot orders decreased by 13% to 33.800 units in the electric / electric industry. In 2013, the proportion of total supply was about 22%. Since 2009, the robot construction industry has steadily increased from about 5,800 units in 2013 to 11,700. Industrial robot industry is projected to rise continuously over years, 2014-2016, accounting for a 9% share, and has declined by 3 percent to around 13,700 products. There will be specific demand between regions and industries. Demand will decrease after three years of continuous growth in robotic systems in conventional and emerging markets in some countries, such as the automotive industry. The robotic investment in manufacturing automation and the retooling of modern production processes would increase in the electrical / electronical industry. Meat, meat and metal industry, in particular, are expected to further increase robot orders from other industries. In North America, Brazil, South Korea, China and the Eastern European markets, among them Turkey, there is planned continued rise in robot sales. Sales of robot to Japan and Germany are likely to decrease because of the saturation on the automotive market caused by substantial investments over the last three years.

Automating farming operations is the need of time with the help of equipment and technology to increase productivity. In recent years, there has been growing interest in the production of autonomous vehicles in agriculture. Many researchers have begun to build rational, adaptable farming vehicles. An idea was introduced in the field of autonomous agricultural vehicles to replace the conventional large tractors with a range of small powerful independent machines. Moreover, this can have a less environmental implications, as controls better suited to stochastic requirements will minimize the overuse of chemical products and high energy and input uses. Numerous field tasks can be conducted by self-sufficient vehicles, which have more advantages than traditional machines. Many of the scientists work for autonomous design of mobile agricultural robots for precise farming. In addition, such a device can have a less environmental effect, because the regulation of overuse of chemicals and the high use of energy and inputs better matched with stochastic demands may decrease. Many fields can be done by autonomous vehicles, with more benefits than regular machines.

Most researchers are interested in the autonomous design of mobile robots for agricultural precision. Research groups have developed specialist navigation technology for robot use in a single control area, such as the odometer, vision, sensor-basic, inertial, active beacon, GPS, maps-based navigation techniques. This technique is used to prepare crops, crops, reinstallation seeds, crop scouting, weed mapping, micro-spraying, robot portal irrigation, and so on. This technique is used to prepare seed fields. In the science literature, work shows that the production of independent navigation for agricultural machines should be conceived with high security to adapt agricultural machinery to agricultural platforms (autonomous vehicles or mobile robots). Recent technology developments in systems designed specifically for autonomous agricultural vehicles or robots. The literature is well known for autonomous robot work in agriculture. Excellent research in Canada, Japan, Europe, Australia, USA and the production of autonomous agricultural vehicles has been launched in India. Most autonomous work in farming robotics has been performed in controlled environments such as cherry tomatoes, cucumbers, champignons and other fruit picking.

Robots are used for citrus and apples in horticulture. Milking robots, particularly in the Netherlands, were also very careful.The development of these platforms poses however two challenges: designing a physical framework that is adapted to the agriculture environment and designing an technological architecture that incorporates the various electronic devices. A robust and reliable electronic architectural design, fast and easy maintenance, modularity and versatility are important to allow future expansions and the connection of new devices[2]. Because more autonomous farm applications will operate in the coming years, it gives an idea of using agriculture robotics as opposed to industrial robots can be technologically difficult.

WHAT EXACTLY IS A ROBOT?

It is a system that contains sensors, control systems, manipulators, power and software, and works for a purpose. For the design, development, programming and testing of robots a mixture of physics, mechanical engineering, power engineering, structural engineering, mathematics and computer is employed. Many cases can also include genetics, medicine and chemistry. A robotics study means that all these disciplines are actively involved in a problem-solving environment.As unusual as it might sound, there's no traditional robot description[3]. Nonetheless, a robot needs some essential features that will allow you to determine what is and what is not a robot. It will also help you determine what features to create on a computer before it can be called a robot.

The main characteristics of a robot are:

1. *Sensing*

G The robot can perceive its surroundings first of all. This will take place in ways that do not mirror your perception of the environment. The provision of your robot sensors is an opportunity to raise their awareness of their environment: light sensors (eyes), sensors of touch and pressure (hands), sensors of chemical (nose), sensors of hearing and sonar (ears) and taste sensors.

2. *Movement*

A robot must be able to navigate through its surroundings. A robot needs to be able to drive whether it's riding on wheels, walking on legs or propelling by thrusters. The entire robot moves as a robot, like the Sojourner does, or even pieces like the Canada Arm of the robot move.

3. *Energy*

A robot must be in a position to control itself. A robot could be powered by solar, electrically driven and driven by batteries. The energy of your robot will depend on what your robot is expected to do.

4. *Intelligence*

A robot requires some form of "intelligent" programming in the picture. A programmer is the person who gives his 'smarts' to the robot. The robot would need a way to get the machine to know what to do.

CURRENT SCENARIOS OF THE INDIAN AGRICULTURAL SYSTEM AND THE AFFECTING FACTORS

The world's estimated population will rise to over 9.17 billion by 2050 The task for decades to come would therefore be to meet the needs of the increasing world population by creating a highly efficient farm management system while preserving the quality of the climate. Many developing countries, including India, are faced with a lack of agricultural labour. A significant number of young people migrate to the village to lead better lives. As a result, farming is delayed due to labour shortages in its peak season. The agricultural energy supply is used in terms of planning, tillage, seeding or transplantation, fertilizers and chemical application, intercultural operations and harvesting. Human, animal and mechanical energy source is used for agricultural purposes.

The Indian farm has an average capacity of 2.03 kW/ha. Farming machinery operated with human, animal, and mechanical resources does not reduce operating costs, time and other inputs. The tractor is the key power source of the machinery on which most mechanisms rely. Most of the farming is achieved by using the tractor as the main mower with different tools. While the conventional animal plow produced by the countryside produces low production levels and needs more field operations, most farmers still use it.For the seed operation that is conducted with tractor control, a tilted platform planter is used for the seed drill. Requirement for high accuracy and feedback during intercultural and plant defence. Placing the seed at the maximum depth required for the precession applicator for better germination rate. At present intercultural operations are very common for horticultural plants and paddy fields, mainly by using hand-operated equipment including Wheel Hoe and Conoweeder. Both methods are made by hand. Nutrient management, on the other hand, is the essential practice for growing and maintaining agricultural production[4]. The majority of farmers in developing countries are manually applying nutrients without simulating already usable nutrients in the field. Some instrumental set-up has been developed to distribute fertilizer that makes it easier to provide fertilizer in an equal manner (Figure 1).

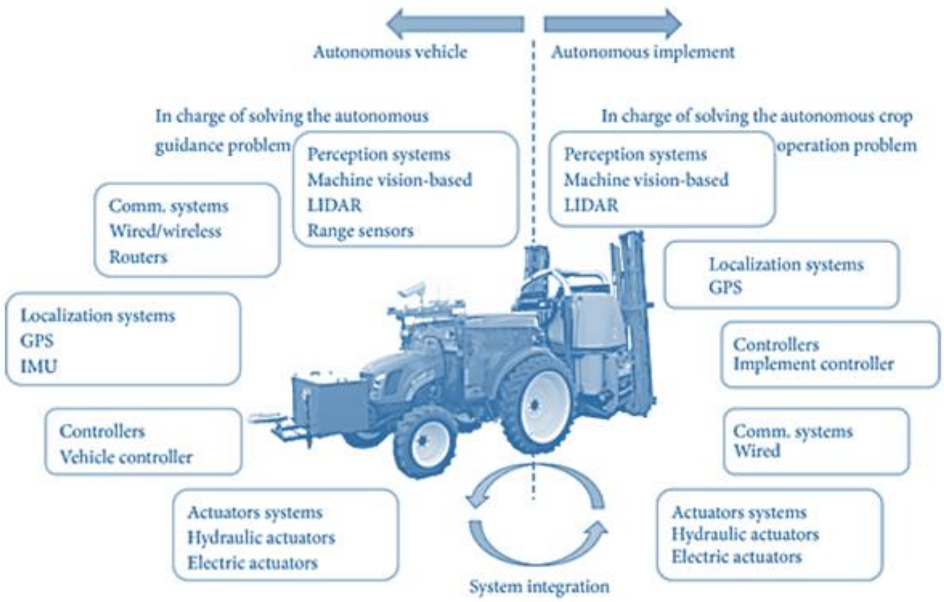

Figure 1: Main System Consisting of a Current Autonomous Agriculture Application, Some Example of Sensor and Actuation System Usually Found in This Application Category.

LIGHT WEIGHT,LOW-COST ANDCOLLABORATIVE

An ordinary industrial robot that was sold last year has most likely been used to weld, paint or pick and place applications, has been surrounded by safety fences and guards, and approved employees with a great deal of programmable skills have been required to program robot movements or pathways. Increased functions as achieved speed, repeatable precisions, power consumption and user-friendly interfaces are historically competing with each other by industrial robot vendors when attempting to comply with all specifications and safety regulations[5]. Yet, in the last few years, robotic vendors have been little by little concentrating on the creation of whole new generation of industrial robots – collaborative robots – in order to expand and diversify the market and offer sustainable solutions to SMEs.

The key attribute is the willingness to interact professionally with men. It poses a range of challenges as these robots must not only be small, lightweight and dexterous, but must also be equipped with integrated sensors and vision systems. Training by example – programming is preferred instead of using deep knowledge of programming. Furthermore, these robots need passive compliance or overcurrent detection to handle external forces and avoid collisions in order to operate securely. In order to carry out an additional task at another station, the majority of working robots can also be conveniently relocated around the facility[5]. The main question for today's industrial robotic growth is how to put all these features together and keep prices as small as possible to be affordable for SMEs.

SWARM ROBOTICS

Swarm robotics is a modern approach to multi-robot teamwork consisting of large numbers of fairly straightforward physical robots. The aim of this approach is to research robot concepts such that a desired collective behaviour, influenced but not limited by the evolving comportment observed by social insects, called swarm intelligence, emerges out of interactions between robots and the environment. This has been found to generate a large number of complex swarm behaviours with fairly simple individual behaviours enhanced by communications. Unlike robotic systems that are typically distributed, swarm robotics prioritize a large number of robots and facilitate scalability through only local communication. for example[6]. Wireless transmission network, radio frequency or infrared connectivity is typically used to achieve local communications.

Potential application of swarm robotics involves tasks that involve extreme miniaturisation, on the one hand, such as distributed sensing tasks in micro- or human-body machinery. Swarm robotics, on the other hand, are ideal for tasks that require extremely cheap designs such as mining or foraging. Artists use swarm robotic techniques for the realization of new types of interactive art-installation. Miniaturization and cost are difficult constraints which emphasize the simplicity of each team member and thus encourage a smart swarm approach to achieve meaningful behaviour.More work is required in order to find methodologies that enable swarm behaviour, given the specific characteristics of individual swarm members to be planned and reliably predicted. Video Tracking, while other monitoring methods are available, is an important tool in order to research swarming systematically. An ultrasonic location tracking device has been developed for swarm testing recently. Bristol Robotics Laboratory.

UNIVERSAL ROBOTS

UR has long experience in a wide range of industries and is the only maker of lightweight robot weapons. UR (shown in Figure2) has launched the next generation of collaborative robots that retain the same UR5 and UR10 architecture. Robots also have the same secure capabilities for human robot cooperation, but with a few additional features.The key enhancements for this lightweight robot are the introduction of absolute encoders, customizable safety features and an increased number of I/Os. True utter encoders are the key breakthrough of the modern generation of collaborative robots. The device makes it possible for the robot to start quicker, as its location is automatically recognized. The redundant electronic board is another addition to the hardware, enabling the robot to reach ISO performance levels D. The new safety features allow the user for each situation to configure the collaborative robot[5][5][5][5]. The robot can work according to context at different speeds. For example, when operating alongside the CNC machine, the collaborative robot will run full speed and slow down when it interacts with people. Settings can be rendered on eight different space safety planes, which means that the robot can automatically change its parameters in eight different areas. TUV tested according to EN ISO 13849:2008 PL d and EN ISO 10218-1:2011 certified all of the new apps.

Figure 2: UR Dual Arm Configuration

GOMTEC – ROBERTA

The Gomtec six-axis, Roberta, collaborative robot was developed for small- and medium-sized companies that want scalable and effective industrial automation. The concept focussed on the development of a lightweight, agile, shop floor-friendly robot. It can carry 7 kg of payload with a weight of 19.5 kg. The highly engineered power and weights servomotors, which eliminates power losses by half in contrast to a traditional motor, are responsible for this feature. This implies that for the same activity, Roberta has a less energy consumption. To simplify the programming and give the robot complete independence, the software and firmware were created. Indeed, the 6-axes of Roberta can be conveniently relocated with any desired orientation to any point in the work area using the Robo Controller, enabling the robot to take the shortest path to its next desired location without going through points of uniqueness. This collaborative robot is supplied with programming-intuitive graphical user interface tools. A variety of industrial controls can also be connected to Roberta. Programming of most collaborative robots is achieved by demonstration. The only difference is that the robot has a revolving ring that has been illuminated. This system offers information on the different points or movements by showing a color-coded confirmation. The robot can be fitted with a certain gripper, which is completely safe for cooperation with the human robot. In reality, the device can detect suspicious objects in the field of view of the robot grip because it is equipped with a camera.Another protection factor that reduces the risk of bodily injury is that the final effector is fitted with finger-stick force sensors. With payload 5.0 kg, 9.0 kg and 13.0 kilograms, Roberta offers 3 different sizes.

PROB ROBOT

The collaborative robot of PRob (see Figure3) 1R has been designed to be a simple robot that is easy to use. All computers, including Smartphones, tablets and laptops, which can support HTML5 and JavaScript can monitor the different aspects and software PRob. The robot supports ROS as well and is programmable with various software packages of 4th generation (Labview, MATLAB/Simulink), as well as all major programming languages, while software design is based on adaptive behavior. The proprietary safe interface enables mechanical and electrical link disconnection operation, which means these specific grippers can only be modified with 2 torches. The final effector has a wide range (60 degrees) to catch big objects, including the 1.5-liter water bottle.

PRob has an operating length of 700 mm and weights just 11 kg. At just 1.4 kg, its payload is small[4]. The PRob consists of soft materials, rounded shapes, minimal forces and end functions, as with most collaborative robots. Without fear of harm to humans, PRob can be incorporated into actual working climate.

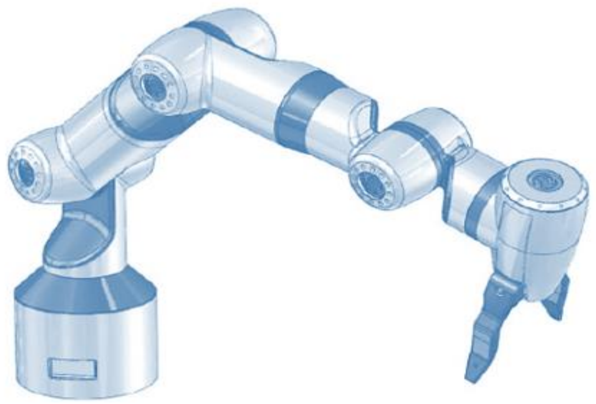

Figure 3: Prob Robot

CONCLUSION

In the last decade, work efforts into creating agricultural robots that can carry out repetitive field tasks effectively have increased significantly. With the exception of milking robots developed in the Netherlands, robot technology for agricultural applications has not reached a commercial scale. Research areas on robotic weaving and collecting were given such consideration in recent years as workforce reduction and manufacturing costs grew, but the quickest prototype weeding and harvesting robots accessible to the operator of human beings were still unable to compete. The autonomous robot can continuously monitor precision agriculture with multiple sensing technologies, providing diverse metrics in the cultivability of cultivated cropping, such as micro nutrient availability, biomass index, pest and disease, water pressure, temperature stress, etc. As the world's population is rising and agricultural jobs are dwindling, the farming system has been limited.Agricultural robot can remove the burden of labour shortages and increase productivity. In a single platform called an agricultural robot, various technologies such as machine vision, image processing and mechatronics can be assembled that provide the optimal solution for independent farming operations.

REFERENCES

[1] H. Ishida, Y. Wada, and H. Matsukura, "Chemical sensing in robotic applications: A review," *IEEE Sensors Journal*. 2012, doi: 10.1109/JSEN.2012.2208740.

[2] S. W. Cunningham and J. Kwakkel, "Innovation forecasting: A case study of the management of engineering and technology literature," *Technol. Forecast. Soc. Change*, 2011, doi: 10.1016/j.techfore.2010.11.001.

[3] A. A.-Q. Zubair, U. A. Oseni, and N. M. Yasin, "ANTI-TERRORISM FINANCING LAWS IN MALAYSIA: CURRENT TRENDS AND DEVELOPMENTS," *IIUM Law J.*, 2015, doi: 10.31436/iiumlj.v23i1.163.

[4] S. U. Senveli and O. Tigli, "Biosensors in the small scale: Methods and technology trends," *IET Nanobiotechnology*, 2013, doi: 10.1049/iet-nbt.2012.0005.

[5] M. Grassi, G. Kaykioglu, V. Belgiorno, and G. Lofrano, "Removal of Emerging Contaminants from Water and Wastewater by Adsorption Process," 2012.

[6] S. Parkes, "City Bike Hire Schemes -Emerging Trends in City Bike Hire Schemes -Emerging Trends in Europe," *Transp. Res. Board, 91st Annu. Meet.*, 2012.