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ROBOTICS

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Robotics

1. INTRODUCTION

1.1. GENERAL INTRODUCTION

Robots are programmable machines that can either be automated or have a person giving them instructions on the tasks they should do. And the branch of technology which is concerned with robots is known as Robotics (May (ed.), 2017). The design and programming of physical robots is a gist of robotics and it may or may not contain artificial intelligence (Owen-Hill, 2017). Robotics makes use of fields like dynamic system modelling and analysis, mathematics, physics, biology, mechanical engineering, electrical & electronic engineering, computer science & engineering and automation (Sharma, 2017). Generally, Robots are assigned with such jobs that are considered dangerous or even life-threatening to humankind. Due to its usefulness, the popularity and use of robots is increasing exponentially.



Figure 1: Humanoid Robot
(Margolis, 2019)



Figure 2: Drone
(Brashier, 2019)

1.2. CURRENT SCENARIO WORLDWIDE

Robotics is a massive hit and an active field worldwide mostly because of its connection with the fields like machine learning and AI. In the present context, a significant increase is seen in not only the number of robots but also the application areas because it eradicates problems like shortages of resources, aging society and shortage of skilled workers. Asia is the world's largest industrial robot market even if growth declined to some extent in 2018. An industrial robot is one which uses

memorizing method and may use sensing or adaptation features to take the environment and special circumstances into account. (Mondol, 2016). Robots that are capable of manufacturing, sensing, computing & processing, AI & Machine Learning, Healthcare, Food & Agriculture, Logistics & Automation, Security & Surveillance, and 3D printing are the trends which are currently on peek as of 2019 (Roboglobal, 2019). The robot named DaVinci is used for medical purposes. It does operations with accurate precision, which results in less bleeding, faster healing, and a reduced risk of infection (Tomlinson, 2018). Also, another robot namely Café X is an autonomous, robotic coffee bar equipped with the power to provide the very best quality of coffee via advanced automation (Tillman & Willings, 2019). Not only these, but there are also numerous robots with their unique tasks and classification that are in use as of present.



Figure 3: Robots in the manufacturing industry
(Crowe, 2019)



Figure 4: Cafe X
(Tillman & Willings, 2019)

2. BACKGROUND

2.1. TYPES OF ROBOTS:

Robots are generally categorized into 5 different types which are as follows:

2.1.1. PRE-PROGRAMMED ROBOTS: They perform easy, dull and repetitive tasks. Their behavior remains constant while they are working. They are mostly used in the automobile industry for the manufacture of different vehicles. They are also widely used in medical sector because of their precision (Bulletin, 2019). For example: CyberKnife is a robot that uses radiation to kill tumors that are seen in cancer patients and other medical conditions (CyberKnife, 2019).



Figure 5: CyberKnife Robot
(The London Clinic, 2020)

2.1.2. HUMANOID ROBOTS: They are the robots that resemble a human. They might even be designed to look like a human or they could also perform human-like tasks. (Bulletin, 2019) For example: Sophia robot looks almost human and can communicate and act like one. It is used in fields such as medicine, education and also in AI research (Hanson Robotics, 2019).



Figure 6: Sophia Robot
(Alves, 2019)

2.1.3. AUTONOMOUS ROBOTS: They do not need human guidance once they are instructed on how to perform a task. For example: Roomba vacuum cleaner is a robot that vacuums the room relying on its sensors. (Bulletin, 2019)



Figure 7: Roomba Vacuum Cleaner
(Robot-advance, 2019)

2.1.4. TELEOPERATED ROBOTS: They are mechanical robots that can be controlled by joystick style setup, console-like controllers and even Virtual Reality and Augmented Reality. Its examples are drones and human-controlled submarines (Conrad, 2018).



Figure 8: Drone
(Crampton, 2017)

2.1.5. AUGMENTING ROBOTS: They mostly improve human abilities or replace the abilities a human might have lost. It is widely used in medical fields. Its example is DEKA Arm, the most advanced version of prosthetics (Bulletin, 2019).



Figure 8: Augmenting Robot
(Trenthings, 2018)

2.2. CURRENT SCENARIO OF ROBOTICS IN NEPAL

Robotics is rising in Nepal at a rapid pace. Paaila Technology is an organization that is dedicated to create human-friendly robots to aid companies in Nepal integrate AI technologies and make them competitive across the globe. The robots made by Paaila Technology are currently used in different businesses in Nepal namely: Naulo Restaurant, Nepal SBI and so on (Paaila Technology, 2019). The trend of using a robot as a waiter has increased since KKFC became the first restaurant to provide robotic service in Nepal (KKFC, 2019). KKFC plans to open outlets at Civil Mall, Sundhara and at Maitidevi soon because of its popularity. KKFC has three robot waiters (THE KATHMANDU POST, 2018). Furthermore, a lot has been going on in the research of robots and robotics in the Robotics Association of Nepal (RAN). RAN is a non-profit and private organization to provide the platform for students and tech admirers all over Nepal. RAN is established for promoting, educating and competing in the Robotics sector (ICT Frame, 2019). Although there has been no gigantic leap in

robotics, several organizations are standing up to provide international exposure to National Robotics and Tech admirers.



Figure 10: Robot at KKFC Restaurant
(Lama, 2017)



Figure 11: Pari robot by Paaila Technology
(Paaila Technology, 2019)

3. IMPLEMENTATION

3.1. IDEA OF IMPLEMENTATION

There is no doubt that Nepal is an agricultural country with 80 of percent people leaning on agriculture in some way or the other (Hibbett, 2018). But hiring workers for working on the field has become more and more difficult every day. Also, the need for task automation is increasing exponentially in the agricultural world. To overcome this problem, agricultural robots, also known as agribots can provide a huge helping hand. Farmers have to encounter many challenges on the field while ploughing, spraying pesticides, sowing seeds and even cutting grass. This becomes very costly for farmers. Robots function at shortest time and lowest cost. In addition, farming activities can be increased with a higher degree of precision and performance. Also, the stress on farmers is minimized and health issues are also lowered. That is to say, human effort significantly decreases and the safety of people increases (Umakant & Tiwari, 2017). The agribots like Ecorobotix, Agribotix and a few others are very beneficial for the development of agriculture in Nepal. So, the idea is to implement agribots in Nepal and tackle the problems faced by farmers of this country with the help of proper means and resources.



Figure 12: Automation of Agricultural Activities with robots

(Umakant & Tiwari, 2017)



Figure 13: Indoor Farming with Robotics

(Umakant & Tiwari, 2017)

3.2. PLAN OF IMPLEMENTATION

Farmers in Nepal believe in the traditional way of farming due to which it may be difficult to convince them to use technology. To make them trust the robots, various programs will be conducted throughout the country that showcases the usefulness of the robots. To not let the economy flow outside the country, the manufacturing of agribots is to be done inside the country. And for that, collaboration with robotics giants of Nepal like Paaila Technology is done. The manufacturing of robots inside the country will minimize their costs and will be very beneficial for farmers. The cost of some of these robots ranges from 5 lakhs to 15 lakhs but if they are manufactured here, they would cost way much less. Ecorobotix is an agribot used to target and kill weeds with the help of solar technology so it would be a good idea to implement this robot in rural parts where there is no accessibility to electricity and also in urban parts of the country. Agribotix is another useful robot that collects crop data and measures the health of crops using infrared sensors. This robot can be used in agricultural fields with large production to aid the farmers and save their time immensely. The use of similar robots will tackle a shortage of farmworkers, boost crop production and harvest & care more plants.



Figure 14: Agribotix
(Alexander, 2018)



Figure 15: Ecorobotix
(Alexander, 2018)

4. CONCLUSION

4.1. SUMMARY OF KEY FINDINGS

To sum up, the use of robots has made our life extremely easy. To overcome the difficulties faced by human beings, robots are there. The application areas of robots are also increasing day by day because of its capacity to easily tackle problems faced by human beings. Robots are classified into different types to solve a variety of problems or to make the solution easier. Robots and robotics are not just choices but a compulsion in today's world. The impact of robotics in Nepal is also at an increasing pace. If agribots are manufactured and invested upon, Nepal can take a gigantic leap in the robotics sector.

4.2. FUTURE ESCALATION

The global market for logistics robots will expand very well and hit approximately 11.18 billion dollars by 2022, including robotic hardware, software and service spending (Marketwatch, 2020). According to the Boston Consulting Group, by 2025, robots will perform 25% of all labor tasks. Humanoid robots currently stand out, particularly as companion robots in the medical industry and have the potential to grow even further soon. From doing a small task to saving a life, robots are going to be widespread throughout the world and make lives easier (Gonzalez, 2017). Whole new applications of robotics will be introduced in the near future to move towards the robotics era.

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