**Robotics Impact on saving Human lives**

We are living in computer age, where there is hardly any field left in which 'computer science' is not applied or used.

We are rapidly progressing in field of Robotic engineering or simply robotics . The future world can not be seen without these "Man machines". Robots are already taking place of humans in many fields ie: production of goods, medical field, space exploration, battlefield, security etc. Human race is working hard to save more human lives with use of robots.

Robots are already been widely used in various fields to save precious human lives for example fire-fighting, medical surgery, security forces, bomb diffusal, millitary tasks, removing landmines, rescue operations etc. We will get into detail that how is robotics been used to save human lives.

Robots and landmines:

Landmines are explosive devices that are well hidden in unknown locations and are difficult to detect. It is dangerous threat to human lives. It is estimated that ninety percent of victims injured or killed by landmines are civilians, mostly children. Furthermore, landmines can destroy fields, disrupt agriculture and economic development.

According to the UNICEF, there are an estimated 110 million active landmines buried in over 64 countries around the world. Around 2,000 persons are involved in monthly landmine accidents, 800 (40%) of whom are innocent civilians; that is, an average of a victim every 20 minutes dies [1].

So to preserve human lives there is great need to remove landmines by robots rather than manual ways to save more lives.

A landmine detecting robot sweeps the ground to detect the mine. The robot process the signal and decides whether a mine exists or not. The robot uses a sensor to create real-time images of that area. These images are then send to computers and then processed digitally. Finally, these images are used to see if the detected object is a mine or not. Multi-sensor robots could provide an efficient means of safely detecting explosive devices without putting lives at risk. By gathering information from different sensors, the robots can plan paths and help guide soldiers towards landmines safely. Mobile robots use sensor fusion techniques to increase the probability of mine detection and decrease false alarms.

Hazardous Activities:

There are many activities that are performed by humans in hazardous environment posing huge risk to their lives. Many of the worker lose their life in such conditions. A cable tunnel inspection is one activity which put life to great risk. Most of the big cities have underground systems of wires in tunnels. The wires in these tunnels catches fire due to excessive heat . So timely inspection is mandatory for safety. But the worker are at great risk because these tunnels have toxic gases (CO CH4 CO2 ) which might lead to accidents and loss of their lives. Robots that are compact in size are being used to detect presence of these gases and it also check the temperature of the cable.

These robots take images and the way of the tunnel is recognized by an image processing algorithm. If the way is blocked, the robot will stop and send the status of the tunnel to a monitor. Otherwise, the robot will plan its moving path according to the image processing result. It also checks the concentration of gases, like CO, CH4, CO2 and O2 are collected in time. These robots also check the temperature by using the bright laser spot location in a frame of image. If the temperature or the gases' concentration is not in a safe limits then, a warning signal will be shown and the robot will come back to the overhead bin.[2]

The robot sometimes also can be used in other dangerous tunnel environment for replacing manual inspection like the road tunnel.

Robotics in Search and Rescue:

Planning of using robots in Search and Rescue operations during disasters like

earthquakes, typhoon, tsunamis which in some cases cost lots of human life.

In 1995 japan was stuck with an earthquake of 7.2 magnitude, which was

one of the most devastating urban earthquake which took 6432 human lives and damaged

property costed 10 trillion JYE(=100 billion USD). This Catastrophic event triggered research

into recuse robotics in Japan.[3]

Scientists and engineers are working hard everyday to advance in technology to develop even better robots which can save more lives of both the victims and the rescuers.

Whenever disasters like earthquake strikes and buildings gets damaged or completely destroyed, at that moment every second counts to save as many human lives as possible who are struck underneath the rubble. Many people die without getting help from rescuers and many times challenge arises when victim is stuck under rubble and rescuers can't reach them or have trouble locating their exact location. Scientist and engineers are developing small robots HELIOS VII which are equipped with a camera, can move on rough terrain with specially equipped tracks and can travel to places which are hard to reach. Thus providing a better vision to the rescuers and increasing the chances of saving victim. Also another version of HELIOS is carrier which is equipped with UWB radar system which transmits UWB pulses down towards a subject buried under a rubble. This method detects respiratory motion of survivors in the received signals. Thus improving the chances of locating people under rubble where even cameras can't reach.[3]

Even EU has funded a project NIFTi which is aimed at building intelligent, collaborative robots that could aid humans in exploring disaster sites. In 2012, Mirandola in Emilia-Romagna,northern Italy was stuck with an earthquake and NIFTi was deployed for reconnaissance mission. [4]

Robots and COVID19

The outbreak of COVID19 became a pandemic, us humans were not prepared for it. Since this Corona virus spread through human contact, robots could have been used to reduce/avoid contact between Doctors and nurses with patients. Robots have potential to be deployed and assist front line workers with disinfection, delivering food and medicines, assisting border controls.[5]

"COVID-19 may drive sustained research in robotics to address risks of infectious diseases."[5]

Brigham and Woman's hospital in Boston deployed a robot called "Spot" which is developed by robotics firm Boston Dynamics. Although Robot Spot is only being used for interviewing patients but Boston Dynamics are experimenting by attaching a UV-C or other technology on back of robot, that could be used to kill virus particles and disinfect surfaces.[6]

References:

[1] R. Achkar, M. Owayjan, and C. Mrad "Landmine Detection and Classification Using MLP", IEEE

Third International Conference on Computational Intelligence Modeling and Simulation, CIMSim

2011, Langkawi Malaysia, September 20- 22, pp 1-6

[2]Gregory, B. , (2000), Choices and considerations for the selection of power cables in tunnel installations, Cables in Tunnels, (9 May 2000), pp.1–9

[3]Tadokoro, S.. (2009). Rescue robotics: DDT project on robots and systems for urban search and rescue. 10.1007/978-1-84882-474-4.

[4]NIFTi (Natural Human–robot Cooperation in Dynamic Environments). 2013. Available from: [http://www.nifti.eu](http://www.nifti.eu/). [Google Scholar]

[5] G.-Z. Yang, B. J. Nelson, R. R. Murphy, H. Choset, H. Christensen, S. H. Collins, P. Dario, K. Goldberg, K. Ikuta, N. Jacobstein, D. Kragic, R. H. Taylor, M. McNutt, Combating COVID-19—The role of robotics in managing public health and infectious diseases. Sci. Robot. 5, eabb5589 (2020).Google Scholar

[6]https://www.bostondynamics.com/COVID-19