

Use of Robots as Facilitators of Socio-Economic Growth and National Development: A Review

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Abstract: At a time when the world is battling with global recession, the aim of all developing countries is to attain the 'developed' status. However, the situation seems to be turning from bad to worse for many of them. Increased inflation, high interest rate, reduced consumer confidence and real wages, fall in oil price, terrorism, low agricultural output, etc. are some of the factors considered to be responsible for such economy decline. Deployment of robots is one approach experts believe can help turn the tide. The aim of this paper is to present a review of the use of robots as facilitators of socio-economic growth and national development. Nuclear power plants, military/security, industries, Medical science, Agriculture, Education are the identified areas of application of robots which can have huge positive effect on socio-economic growth of any nation.

Keywords: Robot, social, economic, development, growth, robotics.

I. INTRODUCTION

In the event of outbreak of contagious diseases e.g. Ebola, the clamour for devices/systems which are capable of long distance monitoring of isolated patients is usually high in order to protect medical specialists/practitioners thereby preventing widespread of such diseases. Many lives have been lost in the past due to unnecessary exposure to toxic substances, radiation, extremely high or low temperature in the work place environments, nuclear power plants, etc. While history will not forget many gallant soldiers/military personnel whose lives were placed on the line in the course of spying or disposal of dangerous objects such as bombs, explosive devices, etc. This is worrisome considering the fact that such risky adventures could have been avoided by delegating those tasks to robots which are specially designed for such purposes.

At a time when the world is battling with global recession, the aim of all developing countries is to attain the 'developed' status. However, the situation seems to be turning from bad to worse for many of them. Increased inflation, high interest rate, reduced consumer confidence and real wages, fall in oil price, terrorism, low agricultural output, etc. are some of the factors considered responsible. Deployment of robots is one approach experts believe can help turn the tide. The word robot was first brought forward by Karl Capek in 1921 in his play R.U.R (Rossum's Universal Robots). George Devol and Joe Engelberger developed the first industrial modern robots in the late 50's and early 60's [30].

Robots are reprogrammable, multifunctional machines which can be angular, flat, tubby, spindly, and bulbous, may or may not have faces, bodies and are designed to move materials, parts, tools or specialized devices through various programmed motions for the execution of one or more tasks with speed and precision. While the fear of being replaced or displaced by robots is so common among low and middle skilled workers, robots have been considered essential in a workplace of the 21st century and so have been adjudged to have finally come to stay due to their capability to carry out dangerous and nasty tasks especially in the auto, nuclear, and medical manufacturing industries. Robots, unlike humans, can survive hazardous situations. They are capable of carrying out tasks with high degree of accuracy in environments which are: subjected to extremely high or low temperature; full of radiation, toxic substances, and chemicals [31].

The aim of this paper is to present a review of the use of robots as facilitators of socio-economic growth and national development.

II. AREAS OF ROBOTICS

The six key aspects of robotics which are expected to make major economic impacts and transform societies are: drones, artificial assistants, driverless cars, medical procedures, operations, prosthetics and exoskeleton [31]. In this section, we shall discuss some of them.

A. Drones

Drones are just robots with a flying capability. They can be flown anywhere without the support of a pilot, hence they are referred to as auto-pilot or unmanned aerial vehicles (UAV). Drones can be equipped with other components such as machine guns and cameras to take pictures and record videos. They can be controlled either remotely by a human operator or by an on-board computer. Mostly, drones, known for their precision and stealth properties, are used in the military to launch or prevent attack.

B. Driverless cars

Self-driving cars, automated cars, autonomous vehicles are other names used to describe driverless cars. As their names imply, they are just car-like robots which can be driven from one place to another without a driver, say a human. The history of driverless cars can be dated back to 1478 when Leonardo da Vinci designed a first prototype. US legalized the use of driverless cars on public roads in 2011. Considering the number of impacts driverless cars are capable of making, other countries are expected to follow suit in the not too distant future. Reducing the number of accidents, enhancement of traffic flow, improving emission compliance, etc. are some of such impacts. With driverless cars, we may be gradually moving into an era where commuters can sleep, read, make calls, etc. while travelling [25].



Fig 1: Drones [24].

III. APPLICATIONS

A. Nuclear Power Plants

Huge revenue loss, business disruptions and limited access to social amenities are some of the effects of dwindling electrical power supply. Constant power supply has been identified as a major prerequisite for socio-economic growth and national development of any nation. Nuclear power, according to the conclusion of the International Ministerial Conference on Nuclear Power in the 21st Century, remains an important option for any nation to improve energy security and provide energy for development. Nuclear power constitutes 20% and 75% of electricity in USA and France respectively. 15 countries are known to rely on nuclear power for 25% of their electricity. No doubts, Nuclear power plants are very hazardous places due to the presence of high level of heat, humidity, and radiation. Humans are usually advised to stay away from sections of nuclear power plants where radiation and heat are usually concentrated and intense. This is due to the damage and injury they are capable of inflicting on humans. Robots, due to their capability to work in hazardous environments, have been deployed to carry out some very important tasks in those places where human presence is limited to prevent unexpected breakdown of vital equipment and most importantly to ensure there is uninterrupted power supply to the populace. Such tasks include: cleaning, inspection, surveillance, waste and dangerous objects disposals, picking and dropping, repair, maintenance, etc. Simply put, without robots, it will be difficult for nuclear power to live up to its expectation as a sustainable development technology [8], [9], [10], [11].

B. Industrial applications

Industrial development contributed immensely to the rapid economic growth experienced by countries like China and Indonesia. Some of the problems facing small scale industries- a sector identified as one of the drivers of economic development- are reluctance of skilled workers to work in certain areas, absenteeism, high labour turnover indiscipline, strike, etc. Humans will always be human, so they are bound to: get sick; sometimes, violate company rules; demand raises; be bored by repetitive task; need rest; and be unable to work on 24*7. Humans cannot withstand extremely high and low temperature. Robots have been designed and developed to overcome some of these humans' shortcomings. While the aims of deploying robots in some places are to improve operational safety and reduce the risks which are associated with the work to be carried out, in most industries, robots are usually preferred to humans in other to facilitate: Increased labour productivity, total factory productivity, raised annual growth of gross domestic product (GDP), etc. Industries where robots services are mostly needed are: auto-mobile production, metalworking, machinery manufacture, medical, and space. Some of the tasks which robots are usually deployed for in these industries include: assembling, welding, picking, packing, cutting, drilling, milling, and cleaning. [9], [7], [31], [12].

C. Security/Military applications

Insecurity is a threat to the socio-economic development of any nation. Huge revenue loss, loss of lives and properties, environmental degradation, disruption of academic activities, limited access to social amenities, etc. are some of the effects of terrorism. A typical example of areas under the siege of terrorists is the southern part of Nigeria where about 250,000 barrels of oil are lost per day due to vandalism of oil and gas pipelines. Syria, Sudan and Iraq, etc. are also facing similar challenges and it will take years for these countries to recover from the huge loss incurred and regain their lost economic glory. The attainment of economic growth by any nation is largely a factor of how she handles issues of internal security. One major security tools which can be deployed to curtail the activities of terrorists are robots. Drones and robot cars are types of Robotic vehicles which are mostly used for military applications. Aerial surveillance is very important when it comes to maintaining civil order and safeguarding the populace against attack. Drones are cheaper, faster, quicker, and more effective alternative to helicopters for detection of terrorists' hideouts, policing, perimeter monitoring, border control, hostage rescuing and traffic monitoring. Robot cars are mostly used for bomb disposal, spying, border patrol, etc. Another important area of application in the military is the use of robots to provide surgery for soldiers on the battle field while the surgeons are miles away [21].

D. Education

In developed countries, most nursery and high schools adopt the use of robots as teaching aid to foster students' grasp and understanding of certain subjects and topics. Robots which are capable of teaching young ones science, mathematics and basic programming have been developed. Typical examples are: Robosem, a telepresence-focused robots, that teaches children English in south korea; NAO, a robot that teaches programming and also helps teacher to gain students' attention while teaching; and Nijiya Kurota, a robot that teaches calligraphy in Japan. In the same vein, teaching robotics at the secondary school level, according to Fabiyi, Abdulmalik, and Tiamiu (2016), is capable of: creating job opportunities, increasing interest in engineering and computer science among prospective university candidates, enhancing students' academic performance, and proffering solution to the problem of digital divide. Education is the foundation of any national development and the best legacy any government could bestow upon the people. If any society is going to experience any meaningful socio-economic growth and national development, the people thereof must be educated in other to acquire necessary technical capacities. Considering the magnitude of the roles robots play in education as learning tools, one can then say they are indeed facilitators of national development [31], [16], [17], [18], [19].



Fig 2: Using robots as a learning tool

E. Medical Science

Health, they say, is wealth. Lying at the very heart of revolution experienced in the medical field in recent years are robots. The use of robots has made the long distance monitoring of isolated patients easier. Other benefits offered by the use of robots in medical sciences are: care for the elderly, restoration of lost body parts, training of medical doctors, patients rehabilitation, diagnose of disease, surgery performance, etc. Remote surgery, minimally invasive surgery and unmanned surgery are made possible through the use of robots. The use of robotic technology offers solution to some of the problems encountered in the past by surgeons during surgery session. They include: less blood loss, less pain, reduced healing time and high precision [22], [23].

F. Agriculture

It has been shown that the overall development of any country can be enhanced by increasing the agricultural output and productivity. One technology that will surely help in boosting efficiency and agricultural output is robotics. Water-wetting robots, drones, etc. are robots which can be used to maximize agricultural yields. They are mostly employed for wetting, monitoring of crops' health, assessing drought condition, and applying insecticides. Using them in carrying out those tasks saves time, energy, and money. [28].

G. Others

With Robotic exoskeletons, persons with paralyzed limbs, stroke and spinal cord injury has a better chance of walking again [27].



Fig 3: use of robotic exoskeleton

IV. ROBOTS, ECONOMIC GROWTH AND POVERTY ALLEVIATION

Economic growth is usually accompanied by increased agricultural output, reduced unemployment rate, increased income, increased access to social amenities, etc. it is therefore pertinent to say that the use of robots as facilitators of socio-economic growth and national development, if holistically pursued by any nation, can help bring about poverty reduction.

V. CONCLUSION

A review of the use of robots as facilitators of socio-economic growth and national development has been carried out. Nuclear power plants, Military/Security, Industries, Medical science, Agriculture, Education are areas of application of robots which can have huge positive effect on socio-economic growth of any nation. Robots, economic development, and poverty alleviation were shown to go hand in hand. It is therefore suffice to say that any government who is really interested in the well-being of its citizens should, as a matter of urgency, adopt and implement policies that will foster the use of robots and robotics in the aforementioned areas/sectors.

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