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Case Study of Sophia – The Humanoid Robot

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Abstract

As different robots are being developed, inventions of humanoid robots have given rise to new era of revolution. Humanoid robots have become manifestation, a tangible form of artificial intelligence. Now a day, robots are being highly practiced in various fields. In this paper, we are elaborating the case study of Sophia- the famous humanoid robot. Sophia is a latest humanoid robot with the most advanced creation of robotics. She can behave autonomously without being supervised and controlled by human to interact with people naturally. The way artificial intelligence programmed on this humanoid robots have given a new vision towards robotics for programmers and developers. A lot of time, money, effort can be saved through this advanced robotics in artificial intelligence. But to keep some severe things in safer side, the artificial intelligence may be restricted up to certain limit.

This paper has identified Sophia's strength and weaknesses. Nowadays Sophia is popular as humanoid robot but there is still need of improvement.

Keywords: *Robots, Humanoid Robots, Artificial Intelligence, Sophia, Programmers, Developers*

1. Introduction

1.1 What is Robotics?

Robotics is a kind of specialized engineering that involves the combination of mechanical engineering, electrical engineering,Computer science.Mostly it is said to be a branch of artificial intelligence which deals with study of design,its construction,operations performed on it and how it will be used in developing robots

Robots are being developed with the concept that they can do work such that difference between human work and robot's work cannot be differentiated.Even that robot can perform the difficult task that human cannot do easily in conditions leading to risks,improper output or where humans are unable to survive

Now a days, this field is growing rapidly as new technologies for developing robots are being invented. Robots are being highly used in various fields such as in house, hospitals, restaurants, industries, military defense, space, etc.

Robot Institute of America defines robot: "A robot is a programmable, multifunctional manipulator designed to move material, parts, tools or specialized devices through variable programmed notions for the performance of variety of tasks" [1].

1.2 Types of Robots

There are various types of robots distinguished by its characteristics and operations.

1. Stationary Robots

Generally, we all mean for stationary as the objects that do not change their position. But here, the stationary robots mean that while doing/performing operations, the robot's base does not move.

Stationary robots include the following [6]

- Cylindrical robot
- Cartesian/Rectilinear/ Gantry robots
- Polar/ Spherical robot
- SCARA
- Articulated (Armed) robots
- Parallel robots

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2. Wheeled Robots

Wheeled robots are the robots that move from one place to another using "wheels".

Wheeled robots include the following[6]:

- Single wheeled
- Two- wheeled
- Three wheeled
- Four wheeled
- Tracked wheeled
- Multi wheeled

3. Legged Robots

The legged robots are those robots which change their position using leg- shaped structure. Here, leg- shaped given to robots can be like human beings or types of animals.

Legged robots include the following[6]:

- Single legged
- Two legged (Bipedal Robots) (Humanoids)
- Three legged robots
- Quadruped Robots
- Six legged robots
- Multi numbered legged robots

4. Flying Robots

Flying robots are the robots that can maneuver and fly high on the air using structure like bird- wings, plane- like structure [6].

5. Swimming Robots

Swimming Robots are the robots that can float on water and swim under water like in sea and rivers [6].

The other types of Humanoid Robots are like Mobile Spherical Robots/Rolling Robotic Balls,Micro Robots,Nano Robots, Swarm robots- With multiple other small robots, Modular robots, Crawler robots, Hybrid robots also exists.

II. Humanoid Robots

A humanoid robot is a robot which has its overall look, characteristics, shape, structure which mirrors the human body. The designing of human robots is made such that they consists functional ability to work with various tools and environment. Humanoid robot duplicates the human structure as it constrains with a torso with a head, two hands and legs [7]. Though some structures of humanoid robot consists only partial parts of human body depending on the work it has to do. Some robots have their faces with eyes and mouth just to appear like human face. The humanoid robot that duplicates male gender is called "Androids" and the humanoid that duplicates female gender are called "Gynoids".

Humanoid robots are designed to behave autonomously, without being supervised and controlled by human to interact with people naturally. Humanoids are not designed just for specific need as a solution but to function at ease in various real- worlds environment like cluttered, noisy, crowdie workspace and do wide range of tasks [8].

III. Literature Review

3.1 Who is Sophia?

Sophia is a latest humanoid robot with the most advanced creation of robotics. The founder of Hanson Robotics, also the chief Executive Officer of the company, Dr. David Hanson created the humanoid 'Sophia'[2].

On April 19, 2015, Sophia the humanoid was been activated and was brought for the public appearance in March 2016 for the first time [3].

"Upending the Uncanny Valley" [2], elaborates that humanoids can be liked, instead of spreading the conception that something that fakes or duplicates human will give rise to revulsion amongst people,. He wrote, "We feel that for realistic robots to be appealing to people, robots should attain some level of integrated social responsibility and aesthetic refinement. Assimilation of social human in every possible detail could help us to make better understanding of social intelligence through both scientifically and artistically.

3.2 How Sophia Got Developed Her Brain

Chief scientist of Hanson Robotics and CTO Ben Goertzel said that Sophia is sophisticated mixture of software called chatbot software and robotics, to build some facetious response, it don't have that kind of human intelligence[4]. Rather than being like human, Sophia is much like user interface which can be coded and programmed so as to run differently in different conditions.

Generally the configuration done for Sophia's software can be divided into three parts:

3.2.1 Software Consists of Chatbot Application.

While interacting with people, she runs a dialogue system whenever required, where she can look towards people, observe what they talk about and then depending on that she chooses the pre=written sentences to respond.

3.2.2 She Includes Reciting Speech robot.

Whatever text Sophia speaks can be preloaded in her brain and then to match facial expressions with text and put pauses between sentences, she uses machine learning.

3.2.3 Artificial Intelligence

It formed artificial intelligence platform for the team. She don't includes pre-written diverting responses in her brain but able to answer simple and easy questions.

IV. More About Sophia

4.1 She was Modeled to Look alike Audrey Hepburn

As per Hanson Robotics, she embellishes Audrey's looks and beauty: [5] skin made of frubberwhich is a flesh rubber and porcelain, a duplicate nose, high bones of cheeks, a meager smile and expressive eyes which are actually small cameras. Audrey Hepburn was a famous actress during Hollywood's golden age. 'Simple elegance' of her has been given to Sophia's look.

4.2 Sophia Has a Sense of Humor

During conferences and interviews, Sophia was been asked questions about what she was feeling to be there. She would answer them by doing banter and wisecracks. Due to her artificial intelligence, she would perfectly use the sentences to answer and remember what to speak and where to speak. Her artificial intelligence was developed to hold eye contact, recognition of faces can be done and understanding of human speech is done simultaneously [5].

4.3 Expressing Several Feelings

By demonstrating various feelings, she can let you know whether she is angry, upset, happy etc. The correlations of emotions to actions are unknown. She was developed to work and stay among people. To make people understand, she needs to express herself the emotions and establish trust and bond with them [5].

V. Research Methodology

The study is based on exploratory research. Secondary data is collected from various sources such as books, web, broadcasting and articles.

VI. Strength of Sophia

Nowadays the robots which are human-like are taking wide step to achieve reality.

The major strength of Sophia is that she can give up to various neck movements and 62 facial expressions, mimicking to human expressions. As her skin is made up of "Frubber" which is combination of flesh rubber and porcelain, electrics current is to be passed to express and show feelings as per the situation.

Her eyes are made up of cameras that includes functionality to recognize different objects and human beings and able to keep eye contact with them. To recognize those objects, her brain consists of appropriate image recognition algorithm. Her artificial intelligence also has the capability of voice recognition. As Sophia is interacting with people, her creators' interpretation is that over time she will get smarter and smarter.

One of the best things happened with Sophia is that she had been given citizenship of Saudi Arabia. This has happened for the first time in the world that a robot had given the citizenship.

VII. Weaknesses of Sophia

As advantages are achieved, corresponding disadvantages also get arise. Here, some downfalls are scrutinized for humanoid robots.

As Sophia was built to finely impersonate as the way human do interactions among them, it is not robot apocalypse sign. Giving rights of robots before people have done crucial to understand the working Sophia so that implications after her can be determined.

She don't have self artificial notion. She is not able to say whether she knows you from previous time than present, where she was before some days and not able to collect and compile past interactions data. She is not perfect to clasp the objects and surroundings.

The sensors that are fed into her must cope up with the environment like crowd of people, noisy area that is not a simple task.

The limitation that is somewhat observed is that she is not build up with the decision making power. In critical conditions, when practicing robots like Sophia, she should be able to take strong decisions which are safe and protective to human beings as emergency can occur sudden, at any time.

CONCLUSION:

We observed that Sophia answers smartly to every question that is asked to her. But it is interpreted that sometimes she has nothing in her brain to answer specifically. So she just changes the subject by cracking jokes or asking new question back instead of answering. By this way we come to know, her artificial intelligence is not developed much to analyze things correctly and lacks in proper decision making. In upcoming years, improvement artificial intelligence for humanoid robots can boost technology and their services for mankind. Social robots like Sophia can save people's lot of time, effort and money.

SUGGESTIONS

Artiicial intelligence's one of the type is processing natural language. This feature implemented in Sophia humanoid is still lacking somewhere to answer the questions properly. Finding and matching right pre written scripts and piecing and assembling together has to be improved for better communication. When this is combined with the machine learning, it appears to be satisfactory results. But this can be caught when introduced to noise, a literal noise.

It can be suggested that filtering of these background noise should give more clear results, such implementation has to be done.

Sentences that are related to each other when asked in bunch to Sophia humanoid should response accurately, which is suggested to improve.

Importantly, decision making power which would take artificial intelligence to next level, and work and research on it has to increase and get done.

It can be suggested that humanoids like Sophia when done more improvements can be used in rescue operations and hospitals where people more need them

Children having autism disorder, who get afraid to interact to people behaving impatiently, can be made to interact with humanoids like Sophia, learn things properly.

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