

# Innovative & Futuristic Trends in Computing and Intelligent Information Technology(IFTCIIT)- June, 2022

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### Case Study of AMECA – The Future Face of Robotics

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**Abstract:** As different robots are being developed, inventions of humanoid robot 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 AMECA- the famous humanoid robot. AMECA is latest humanoid robot with the most advanced creation of robotics. The AMECA humanoid robot is designed to work with humans and provide relatable natural human gestures. It is designed with upgradeable modular mechanics and can be controlled via a cloud- manage API dev kit. The main purpose of AMECA is as a platform for developing artificial intelligence. The focus is mostly on developing robotics hardware and researchers working with its platform to create artificial intelligence and machine learning algorithms for their hardware. Since the robot is cloud- connected, if something goes wrong, engineers can remotely connect to it to diagnose problem, and often problem can be fixed remotely.

Research into AI is ongoing, and platforms like AMECA provide the opportunity for interaction beyond a computer terminal with something more human- like. Communication and interaction with human beings are the major task of this robot. Smooth lifelike motion and advanced facial expression capabilities means AMECA can strike an instant rapport with anybody.

The demand of robotics engineers is rising in India as well as abroad. There is a variety of opportunities for professionals in this field. Not only do they get to research but manufacturing, pharmaceutical, FMCG, packaging and inspection. A bit of robotics would also be seen in the technologies. The other promising sectors are defense and education.

The presented paper intends to explore the laws of Isaac Asimov's on robotics and pilot study, recognizing face expression. The purpose is to evaluate the future of AMECA for humans and civilization.

**Keywords:** robot, AMECA, Artificial Intelligence, Artificial body, Mesmer, Tritium, and Modularity.

### INTRODUCTION

The word “robotics” was first coined by Isaac Asimov in 1941 but the first person to actually build a programmable humanoid robot was Al- Jazari in 1206. **Al- Jazari is also known as the “father of robotics”.**

AMECA is an artificially intelligent robot developed by Engineered Arts, the leading designer and manufacturer of humanoid entertainment robots. AMECA is the world's most advanced, most realistic humanoid robot, representing the cutting- edge technology of humanoid robotics. In other way we can say that AMECA is the combination of artificial limbs and ligaments, actuators and sensor array using frontline technology. However, its lower half is currently non- functional.



AMECA is cloud- connected platform that multiplies the power of artificial intelligence with an artificial body where AI and machine learning can be tested and developed alongside Engineered Art’s powerful tritium robot operating system. Companies creating AI or machine learning technology can use AMECA to test and present their technology in front of live audience.

The AMECA hardware is development based on Engineered Art’s own research into humanoid robotics and built on their advance Mesmer technology. The robot’s congeniality makes it a perfect platform for fostering human to human connection in any digital environment.

AMECA has grey– colored skin, with deliberately gender- and race- neutral characteristics. The company calls it the “world’s most advanced human shaped robot representing the forefront of human- robotics technology”.

We can say that AMECA is fantastic with its smile, its ability to blink its eyes regularly, gasp in surprise, scratch its nose, and even have a staring contest with its owner for fun among other high- tech functions. The AI program analyses conversation and extract data that allows her/him to improve response in the future. Engineered Arts has created five robots - AMECA, QUINN, ROBOTHESPIAN, MESMER and CUSTOM.

### **ISAAC ASIMOV’S LAWS OF ROBOTICS**

The three laws of robotics are a set of rules devised by science fiction author Isaac Asimov. The rules were introduced in his 1942 book “Handbook of Robotics, 56th Edition, 2058 A.D.”.

#### **First Law**

A robot may not injure a human being or, through inaction, allow a human being to come to harm.

#### **Second Law**

A robot must obey the order given to it by human beings except where such order would conflict with the First Law.

#### **Third Law**

A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

The original laws have been altered and elaborated on by Asimov and other authors. Asimov himself made slight modification to the first three in various books and stories to further develop how robots would interact with humans and each other. In later fiction where robots had taken responsibility for governance of whole planets and human civilization, Asimov also added a fourth, or zeroth law, to precede the others.

#### **Zeroth Law**

A robot may not harm humanity, or by inaction, allow humanity to come to harm.

It is reasonable to fear that, without ethical constraints, robot (or other artificial intelligence) could go great harm, perhaps to the entire human race, even by simply following their human- given instruction.

## **PILOT STUDY**

There has been public discussion regarding AI ethics and the role reversal in society, when human like robot shall become ubiquitous. Ultimately robot would like to become a wise, empathetic being and make a positive contribution to human kind and all beings.

AMECA is the world's most advanced robot with a truly human form. A robot is the forefront of humanoid robotics technology to a human form with a robotics visage, exposed mechanical, structural, and aesthetic elements. Neutral colored silicone face and hands convey unparalleled expression.

The first generation AMECA is built using the most advanced technology which is currently available. Built with the future in mind, AMECA features modular mechanics and cloud intelligence allowing it to be upgraded as technology progresses.

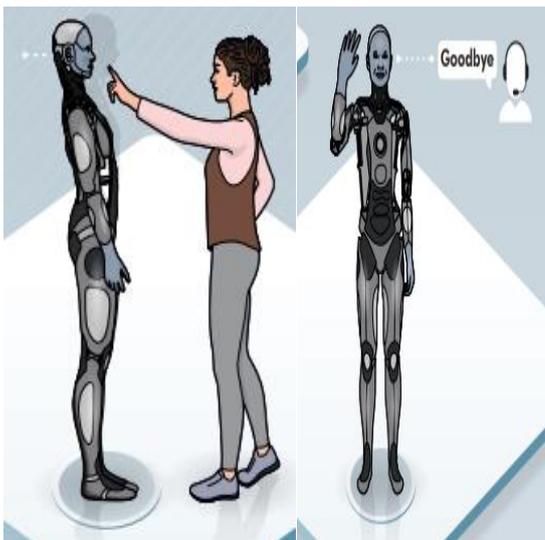
### **Recognizing face expression**

AMECA has the potential to detect face by camera and then uses face tracking and action unit to accurately provide gender, emotion and age(1<sup>st</sup> Generation AMECA January 2022).

The sensors can track movement in the entire room, face recognition can be detected at approx 2 meters, and multiple people voice recognition can also be done.

Some tools that are uses are Binocular eyes mounted cameras, binaural ear mounted microphones, High resolution chest mounted camera, Built- in dedicated hardware for machine learning application.

AMECA is designed with some interactive features : Hand tracking( Many people wave in the robots face, it can now respond), Personal space ( Robot will react as things enter their 'personal space'), Automated gestures( speech recognition of the operator trigger gestures on keywords: Goodbye), Facial mocap for teleoperation( Robot mimics operators expression and lip sync).



## **TECHOLOGIES STUDY**

The field of robotics is fast- growing in this current era, Robots are specialized with their complicated movements with the elegances like back- flipping, practicing parker moves, even “carving” classical sculptures.

So, unique robot needs unique software. All of our lifelike characters run on our state- of- the- art software framework: tritium and Mesmer.

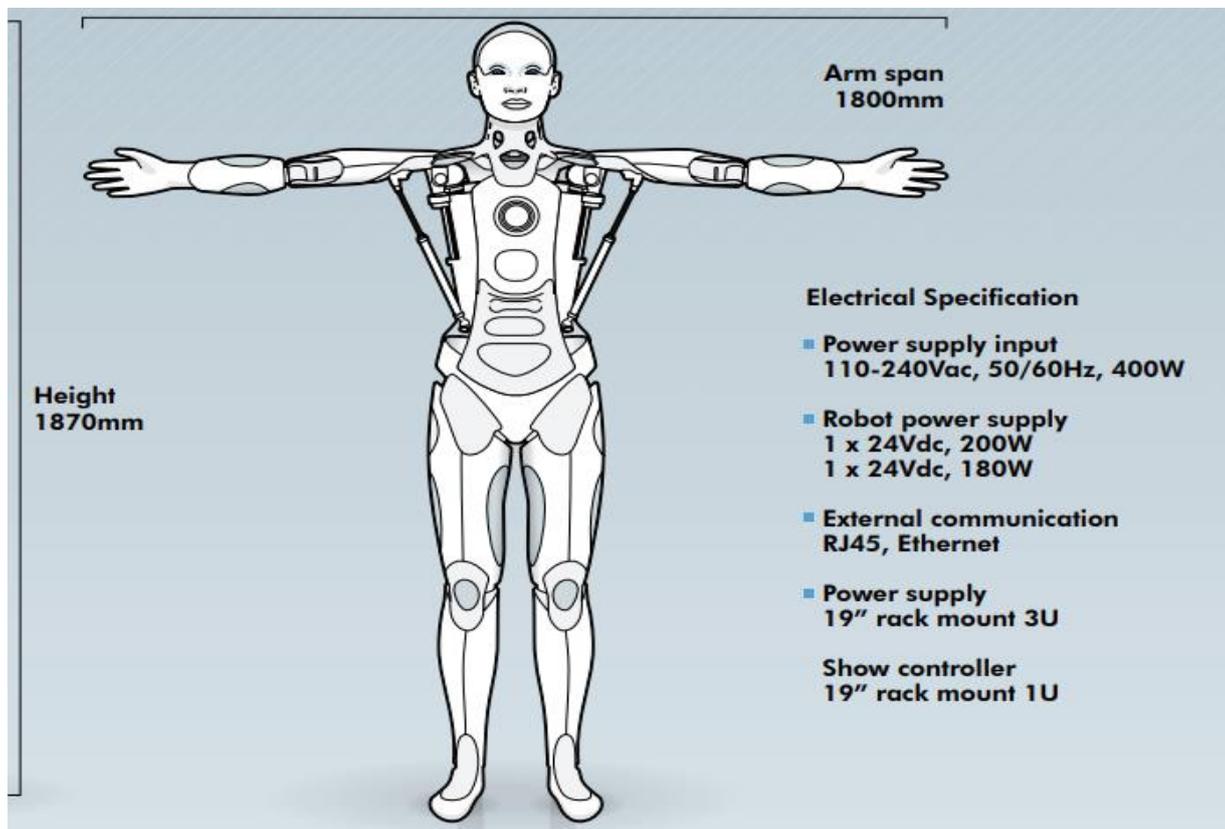
AMECA is powered by Engineered Art's most advanced operating system (tritium 3). That is built from the ground up with a cloud connected focus, integration of new and innovative digital technology. Tritium keeps the robot moving in innovative and breathtaking ways. Built with flexibility in mind, it can operate almost any hardware component from almost any hardware platform.

How the AMECA robots speak to people ?

You may wonder how the AMECA robots speak to people. For that Engineered Art's use in-house software named "tinman". Tritium also integrates the tinman tool, which can control the AMECA robot in real time, and this powerful software is also installed in the browser. Tinman can call AMECA's built-in camera and microphone to easily realize action such as staring at other and entering natural conversation.

- Real time conversion
- Anywhere in the world
- Human to robot telepresence

Mesmer robots can display a huge range of human emotion. Each of Mesmer creations are designed and built from 3D in-house scan of real people, allowing us to imitate human bone structure, skin texture and expressions convincingly.



## ANALYSIS

It is observed that AMECA is very fantastic humanoid robot lifelike human. AMECA was introduced in January 2022 in LAS VEGAS, UNITED STATES in consumer electronics show (CES), January 2022, the largest technology fair on the planet. During this event, a large crowd gathered around to watching AMECA almost every second and interact the robot whose facial features are surprisingly vivid and emotive.

The robot can reply, ask you how your day was and answer questions.

In AMECA's chest is a speaker so you can hear the replies. The engineers couldn't fit the speaker in the mouth because there are 17 motors and lots of electronics in the head so there wasn't any room.

It has plenty of features but something it can't do is walk. But it can take a lot of work because it wants the legs to look similar to human legs.

### **Interesting fact about AMECA:**

All modules can run independently so you can just go ahead, into even only an arm. No need for a full robot.

AMECA has a camera in each of its eyes, so it can detect people, track their face, detect object such as when a finger is held in front of its face, it reacts and hold the hand in front of its face.

AMECA's movements are more lifelike than any other robot- its shoulder movements are just like human movements. It can move its hand all the way to the side of its head.

### **The future of AMECA**

While some people thought AMECA was fantastic, other thought it was alarming and expressed that it may lead to a cyber revolt and robot uprising like we have seen in the movies. Furthermore, Elon Musk has recently expressed concern about the risk of AI in terms of how human we want our robotic counterparts to be. Some of us like Musk may be. Concerned about what our future will look like when the intellect is combined with a flawless human appearance.

## **CONCLUSION**

When AMECA was introduced for public demo in consumer electronics show (CES) then the world's most advanced robot AMECA interview was conducted by Alexa Carlin, the bestselling author, founder & CEO of Women Empower X. She put some questions to AMECA and AMECA answered them very quickly:

Some designing parameters are unreliable, like speaker is inserted on the chest part so it's little bit irritating because sound parameters cannot match AMECA's lips. Public cannot focus on this type of speech. People look at AMECA's lips but ear listen from the chest. AMECA can't walk now but engineers are working on it. In future the whole design structure shall be like human shoulders, gestures, legs shape, face expressions and more.

After over all study about AMECA, It can be said that AMECA is the future face robot. All latest technology is used to operate the AMECA like: Tritium, Mesmer, Tinman, and 3d, Modularity with its plastic and metal body. Grey colored skin is used only to indicate that AMECA is gender neutral.

Artificial intelligence taking problem-solving to epic new levels, AI is revolutionizing the user experience. Whether increasing accessibility or boosting efficiency, AI's state-of-the-art hardware and software solution play an active role in industry development worldwide.

This conversation reveals AMECA as a humanoid whose effectiveness is marred by its structure.

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