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Animatronic

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Abstract: Animatronics is a cross between animation and electronics. Basically, an animatronic is a mechanized puppet. It may be pre-programmed or remotely controlled. An abbreviated term originally coined by Walt Disney as "Audio-Animatronics" (used to describe his mechanized characters), can actually be seen in various forms as far back as Leonardo-Da-Vinci's Automata Lion, (theoretically built to present lilies to the King of France during one of his Visits), and has now developed as a career which may require combined talent in Mechanical Engineering, Sculpting / Casting, Control Technologies, Electrical / Electronic, Airbrushing, Radio-Control. Long before digital effects appeared, animatronics were making cinematic history. The scare generated by the Great White coming out of the water in "Jaws" and the tender otherworldliness of "E.T." were its outcomes.The Jurassic Park series combined digital effects with animatronics. It is possible for us to build our own animatronics by making use of ready-made animatronic kits provided by companies such as Mister Computers where no programming skills are required.Only knowledge of Windows is required.

I. INTRODUCTION

Animatronics refers to the use of robotic devices to emulate a human or an animal, or bring lifelike characteristics to an otherwise inanimate object. Animatronic creations include animals (including dinosaurs), plants and even mythical creatures. A robot designed to be a convincing imitation of a human is more specifically labeled as an android. Modern animatronics have found widespread applications in movie special effects and theme parks and have, since their inception, been primarily used as a spectacle of amusement.

Animatronics is a multi-disciplinary field which integrates anatomy, robots, mechatronics, and puppetry resulting in lifelike animation. Animatronic figures are often powered by pneumatics, hydraulics, or by electrical means, and can be implemented using both computer control and human control, including tele operation. Motion actuators are often used to imitate muscle movements and create realistic motions in limbs. Figures are covered with body shells and flexible skins made of hard and soft plastic materials, and finished with details like colors, hair and feathers and other components to make the figure more realistic.

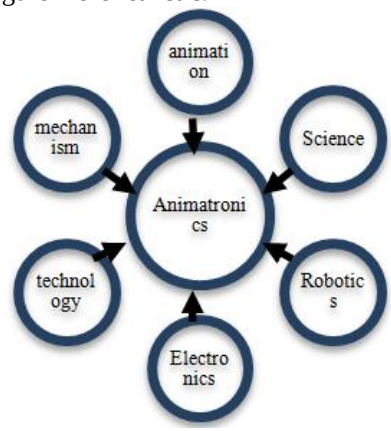

Fig 1.1 Animatronic System

II. OBJECTIVE

The Animatronics is a combination of animation and electronics. What exactly is an animatronic? Basically, an animatronic is a mechanized puppet. It may be preprogrammed or remotely controlled. The animatronic may only perform a limited range of movements or it may be incredibly versatile.

Animatronics gives a special spirit to the imaginary creatures to make them alive. A virtual creature was implicitly formed on the basis of science and technologies. literature survey.

III. LITERATURE SURVEY

3.1 development history

Animatronics was developed by walt disney in the early sixties. The first use of audio-animatronics was for walt disney's enchanted tiki room in disneyland, which opened in june, 1963. Essentially, an animatronic puppet is a figure that is animated by means of electromechanical devices. Early examples were found at the 1964 world fair in the new york hall of presidents and disney land. Body language and facial motions were matched to perfection with the recorded speech .animatronics was a popular way of entertainment that had proven itself in the theme parks and cinematography industry.

An extension of the engineering challenge is to explore the effectiveness of the project's capability to display human emotions, and to design the physical mechanisms that display realistic human facial movements. The objective of this effort was to design and build an animatronic robot ssu-1 (savannah state university-1). The ssu-1 will be controlled by a pre-programmed embedded microcontroller and will create human like motions for entertainment purposes.

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Animatronics gives a special spirit to the imaginary creatures to make them alive. A virtual creature was implicitly formed on the basis of science and technologies. This technology was developed by Walt Disney in the year of 1960. It is the creation of machines which seems so animate. The animated object is as shown in fig 1.1.The implementation of this system can be made by using computer or manual control. Three more kinds of powers can be given to the animated figures such as pneumatic, hydraulic, or by electronic means. The specified controls and the programs are done manually by human.

Fig 3.1. Animated object

IV. SYSTEM IMPLIMENTATION AND DESIGN

4.1 Early Implementations

While functional, early clocks were also designed as novelties and spectacles which integrated features of early animatronics. Fig 3.1 shows the Greek washstand automaton of the 3rd century BC. Approximately 1220–1230, Villard de Honewort wrote The Portfolio of Villard de Honnecourt which depicts an early escapement mechanism in a drawing titled How to make an angel keep pointing his finger toward the Sun and an automaton of a bird, with jointed wings which led to their design implementation in clocks. One of the earliest of these large clocks was the Strasbourg Clock, built in the fourteenth century which takes up the entire side of a cathedral wall. It contained an astronomical calendar, automata depicting animals, saints and the life of Christ. The clock still functions to this day, but has undergone several restorations since its initial construction. The Prague astronomical clock was built in 1410; animated figures were added from the 17th century onwards.

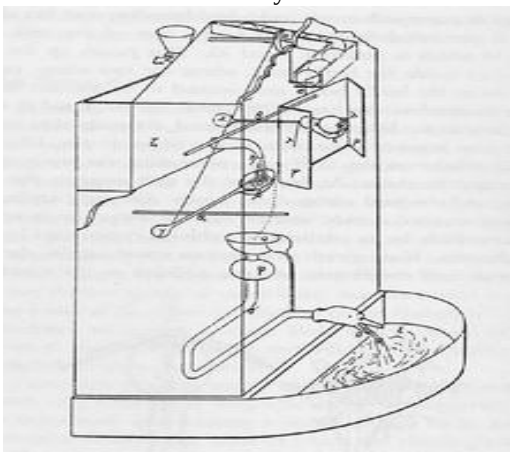

Fig 4.1 Greek washstand automaton of the 3rd century BC
The first description of a modern cuckoo clock was by the Augsburg nobleman Philipp Haushofer in 1629.Fig 3.2 shows the Face of the Astronomical Clock, in Old Town Square, Prague.

The clock belonged to Prince Elector August von Sachsen. By 1650, the workings of mechanical cuckoos were understood and were widely disseminated in Athanasius Kircher's handbook on music, Musurgia Universal is. In what is the first documented description of how a mechanical cuckoo works, a mechanical organ with several automated figures is described.

In 18th-century Germany, clock makers began making cuckoo clocks for sale. Clock shops selling cuckoo clocks became commonplace in the Black Forest region by the middle of the 18th century.

Fig 4.2 Face of the Astronomical Clock, in Old Town Square, Prague

4.2 Film and television

The film industry has been a driving force revolutionizing the technology used to develop animatronics. Animatronics are used in situations where a creature does not exist, the action is too risky or costly to use real actors or animals, or the action could never be obtained with a living person or animal. Its main advantage over CGI and stop motion is that the simulated creature has a physical presence moving in front of the camera in real time. The technology behind animatronics has become more advance and sophisticated over the years, making the puppets even more realistic and lifelike. Animatronics were first introduced by Disney in the 1964 film Mary Poppins which featured an animatronics bird. Since then, animatronics have been used extensively in such movies as Jaws, and E.T. the Extra-Terrestrial, which relied heavily on animatronics. Directors such as Steven Spielberg and Jim Henson have been pioneers in using animatronics in the film industry.

4.3 Advertising

The British advertisement campaign for Cadbury Schweppes titled Gorilla featured an actor inside a gorilla suit with an animatronically animated face. The was an advertising campaign for Comcast Cable'sX finity broadband Internet service. The ad features two animatronic turtles, and it won the gold Effie Award in 2007.

4.4 Toys

Some examples of animatronic toys include Teddy Ruxpin, Big Mouth Billy Bass, Kota the triceratops, Pleo, Wow Wee Alive Chimpanzee and Furby.

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V. HARDWARE AND SOFTWARE DESIGN

Hardware and software control architectures have been designed to meet the engineering challenge. Assigned by the faculty, the project team was composed of two electronics engineering technology students. During the early execution stage the students handled the mechanical design portion of the project. The electrical and electronics concepts which included programming of the microcontroller was faculty led and the students were trained to program the SSU-1 in C programming language. Students also kept a record of their progress including design ideas and sketches, issues faced and their solutions in their individual notebooks. The hardware section of SSU-1 uses Cypress PSOC (CY8C26443-24PI) microcontroller [7]. The microcontroller is programmed in C language to control different facial mechanism of the SSU-1.

A standard micro-controller which is composed of a Cypress PSOC micro-controller eliminated the necessity of secondary students to program micro-controllers and keep their focus on the overall system blocks. The standard program implements a simple interface between the DMX 512 (**D**igital **M**ultiple**x**ed) interface and PWM hardware blocks configured on the Cypress PSOC micro-controller's digital bus. The role of the control electronics was to create a clean interface between the SSU-1 and the high level C++ programming language and FreeStyler512 software to control the SSU-1. The block diagram of the hardware and software interface is shown in Figure 2.

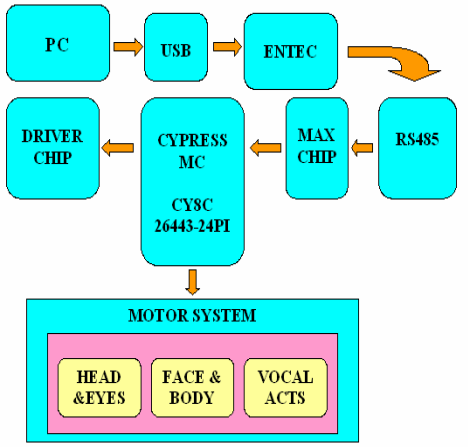

Fig 5.1 Hardware and Software Interface of SSU-1

The communication protocol used in SSU-1 is DMX 512. The DMX 512 and MIDI protocols are two major standards used by Hollywood, the music industry and theme parks. MIDI formatted files can be used to play music or voice over PC. DMX 512 has been traditionally used to control theatre lighting but has been adapted to control animatronic displays and robots. Fig 3.6 shows the Hardware and Software Interface of SSU-1.

In SSU-1 24 DMX 512 channels are used to interface 2 servomotors and 10 LED's. Each servo motor uses 2 channels to control mouth and neck rotation. The hardware interfacing diagram to connect various actuators is shown in Figure 3. The ULN2003AN could be eliminated if no solenoids or relays are involved with the design. Stepper motor controls can be directly connected to the output ports designated in the standard micro-controller interface specification.

The PC provides software for students to synchronize and record movements. In the animatronics world synchronizing sound track and movements is referred to as programming.

There are several software systems provided free of charge that can be used to synchronize sound tracks to movement. For many years the movie, theater, and concerts have relied upon PC based systems to control lighting systems. Modern lighting systems used for concerts, plays and movies use light fixtures moved through servo-motors or stepper motors connected to PC's through the DMX-512 RS-485 protocol.

The Free Styler 512 is a freeware program that is used to primarily control theatrical lighting fixtures. The Free Styler 512 is used by the students in this engineering challenge to control the SSU-1. Adapting the existing DMX 512 standard and the existing software gave the students a rich user interface and eliminated the need to develop software for the PC side of the system. In the standard micro-controller several PWM signals may be generated using the digital blocks. Specific pins on the Cypress PSOC can be attached to several digital and analog output bus lines. The standard interface specification defines the output port lines for DMX channels 1-9.

5.1 Applications of Animatronic

- Animatronic is use in making a dinosaur.
- Animatronics have been entertaining people at amusement parks and in film.
- The "Jurassic park" series is known for the realism of its creatures, both the animatronic and digital versions.

5.2 Limtations & Disadvantages Of Animatronic

They are difficult to build or expensive to buy, they may wear out, they require electricity or compressed air, the cheap ones lack realistic movement or external coverings, people can damage them if they can get close and touch them, the mechanical noises they produce may ruin the effect, most aren't weatherproof.

- It is complex.
- Mostly the need for multiple antennas..

VI. CONCLUSION

6.1 Introduction

Animatronics refers to the use of robotic devices to emulate a human or an animal, or bring lifelike characteristics to an otherwise inanimate object. Animatronic creations include animals (including

dinosaurs), plants and even mythical creatures. A robot designed to be a convincing imitation of a human is more specifically labelled as an android. Modern animatronics have found widespread applications in movie special effects and theme parks and have, since their inception, been primarily used as a spectacle of amusement.

6.2 Conclusion and Future Scope

Creating a good animatronic figure that is able to perform constantly without fail requires many special skills and lots of technical knowhow. Before assuming the task of creating an animatronic figure, you should have a strong hold on how these things are constructed and be willing to spend a pretty penny on equipment and materials.

Animatronics has now developed as a career which may require combined talent in Mechanical Engineering, Sculpting / Casting, Control Technologies, Electrical / Electronic, Airbrushing, Radio-Control etc. But the realistic creatures that it can create are amazing and is rewarding to its creator.

We introduced animatronic Shader Lamps Avatars (SLAs), described A proof-of-concept prototype system, and presented preliminary Results. We are currently exploring passive vision-based Methods for tracking the real person's head [1, 7, 21] so that we Can eliminate the separate tracking system. We also hope to add, Very soon, additional cameras and projectors. Both will involve the Dynamic blending of imagery: as the real person moves, textures From multiple cameras will have to be dynamically blended and Mapped onto the graphics model, and as the physical avatar moves, The projector imagery will have to be dynamically blended (intensity And perhaps color) as it is projected. We are also considering Methods for internal projection. Some of the filtering techniques in could be useful if we use vision based Face tracking as above. Finally, together with collaborators At the Naval Postgraduate School we plan to undertake a series of Human subject evaluations using our next generation prototype.

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