Voice Recognition Based Vehicle Manufacturing

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Abstract - **Nowadays automation systems have become popular. The notion of AI is well known due to its popularity in science fiction movies which depict humans interacting with machines as they would with other humans. Speech Recognition Software is the technology that transforms spoken words into alphanumeric text and navigational commands. The system we have designed uses a voice recognition module for the automatic manufacture of cars. This scheme consist of Artificial Intelligence algorithms such as speech recognition ,decision making planning algorithms and also modules for voice recognition like IOT, Arduino, relay and a robotic arm. The prototype design can be extended for several applications including manufacture of various other automobiles.**

Keywords - **Arduinouno,decisionmaking,hidden Markov model,speech recognition.**

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I. INTRODUCTION

Vehicle manufacturing refers to the application of design using HCI and automation. In the upcoming days vehicle manufacturing has to become simpler and ease.

Vocabularies, multiple users and noisy environment are the major factors that are counted in as the depending factors for a speech recognition engine. In our design of vehicle manufacturing we need to automate the manufacturing and fixation of parts that need a voice recognition system.This ensures security measures for more accurate manufacture of different types of cars using a single android tool and a single robotic arm.the concept of "decision" is antinomic to the idea of program.

When a task is programmed, the decision no longer exists since actions are determined according to each possible situation that may occur. AI is often regarded as the science of knowledge representation and reasoning. Speech recognition is a technology required by a machine to be able to interpret human speech. Some commercial speech recognizers can now handle continuous speech with an accuracy of more than 90%. Speech synthesis tools are also now widely available, examples of such tools are Microsoft's Speech API and Speech Works Speechify. Manufacturing requires assembly, construction design, and then confirm that production vehicle meets performance targets. Technological advancements make things easier.

II. LITERATURE REVIEW

Peng Jiao[1] presented information on decision making for diversity voting.Decision making involves perceiving current state,matching it with the file of recorded states and then performing chosen action.Rajesh H.Kulkarni[2] presented information on implementing artificial intelligence in integration of development process. RanjithBalakrishnan[3] proposed a system based on monitoring a control using IOT.The system uses Raspberry pi and server for automation. SyarifHidayat[4] presented a paper for implementing a voice recognition system.The paper we have presented here consists of an android device,speaker and internet for the purpose of recognition.

III. VOICE RECOGNITION BASED CAR MANUFACTURE

In the recent years,the automation in the manufacture of cars have become popular using various automation equipments integrated with expert systems.Due to this the manufacture using human-robot cooperation has increased.

Audis collaborative robots in Ingolstadt,known as "cobots".It pick up components and pass them to workers.we can overcome this condition as such we have implemented a voice recognition system for automating the job of the workers.A prototype of this presents Design for Manufacturing and Assembly (DFMA)using voice recognition.So far, robots have been mainly used in the automotive industries, including their supplychains, accounting for more than 60% of total robot sales. Typically prime targets for robot automation in car manufacturing are welding,assembly of body, motor and gear-box, painting and coating. Automotive industry, as the key application driver in terms of their cost,technology and services robotics industry, are subject to fierce a global competition.

Cost effectiveness is ensured by means of Arduino.This project mainly focuses on robot acting according to instruction received from human.

A.Block diagram of voice recognition based car manufacturing

Figure 1 shows the block diagram of voice recognition based automation system for manufacture of cars.An android application is required to be installed at first.The design for voice recognition module consist of an IOT board,Arduino and then a relay to drive the robotic arm.Thus we can automate using a robotic arm by our voice commands to perform physical operations like forming many assembly jobs like painting,finishing,welding,riveting, and installation of cars.

This ensures proper installation by human voice,even if the programming is considered a complex task.
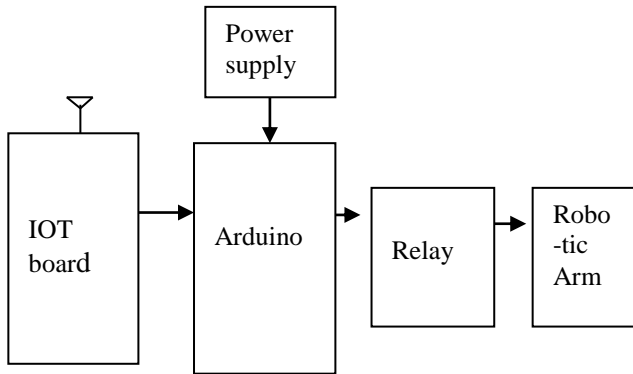
Fig1.Block diagram of Voice recognition based car manufacturing.

IV.   SYSTEM DESIGN

A.Planning and design

The system requires various algorithms for its implementation such as Hidden markov model speech recognition,decision making planning algorithms.The new expert system can act according to our needs.Cognitive handling and working with machines can be designed.

There is mechanics for mounting the wheel on the axles, connecting them to the motors and keeping the body in balance.you need electronics to power working of the motors, connecting sensors to the controllers and then the software to understand the sensors and drive the robot around.

After the software, Programming part there is an electronic driver that stimulate working of microcontroller, motor driver IC and dc motor.The voltage is monitored and controlled from the remote locations using the wireless technology.

When the user wants to know the voltage status, the user needs to speak through a microphone which is stored in the database. After this, simulation is performed through IOT and will recognize the speech and will read the status of the voltage from the microcontroller, then the data will be displayed on LCD.

B.Speech recognition

The task is to use a speech sample to select the identity of the person that produced the speech from among a population of speakers.Speech signal is the process of converting the required speech signal to a sequence of word.

Speech recognition requires an android application for its working.The application consists of a button called "click me".when you click on the button ,you will find a mic icon.There you need to give your command .

Speech recognition is the mapping of an acoustic signal to meaningful linguistic units.It consists of a probabilistic framework based on HMM.Learning of the sound signals is done by various algorithms like deep learning,deep neural network and Restricted Boltzmann machine by which the computation is performed.

Here,in this context the command will be given to the android phone ,utterances will be captured ,a wave file will be generated to extract data then speech recognition is performed to enable the required parts of a car to be manufactured using a robotic arm.

 C.Software specification

     The software product used in android application are Google voice and speech API packages.The algorithms like hidden markov model used in recognition is shown in the below figure,
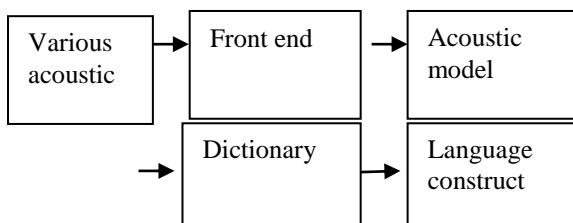

Fig3.Hidden Markov Model

The feature extraction is performed and then the feature vector is obtained .It is then sent to the acoustic model to distinguish meaning of words.Dictionary find corresponding words then recognized word is constructed from the lexicon. A Hidden Markov Model is a Finite State Machine having a fixed number of states. It is a statistical method of characterizing the spectral properties of frames of a pattern. The underlying assumption of the HMM is that the speech can be well characterized as a parametric random process and that the parameters of the stochastic process can be estimated in

well defined manner. An approach to the recognition of speech signal using frequency spectral information.This is applied for speech recognition process.

The instructions can be given to the arm as Assemble part1 i.e.,part1 consists of gripping,stamping.then assemble part2 i.e.,welding,body in white operation,then assemble part 3i.e., part3 consists of spray painting by the robotic arm.The designer will make basic sketches of the automobile using computer-aided drafting (CAD), and will then produce more detailed 3-D images which consists of parts designed accordingly.
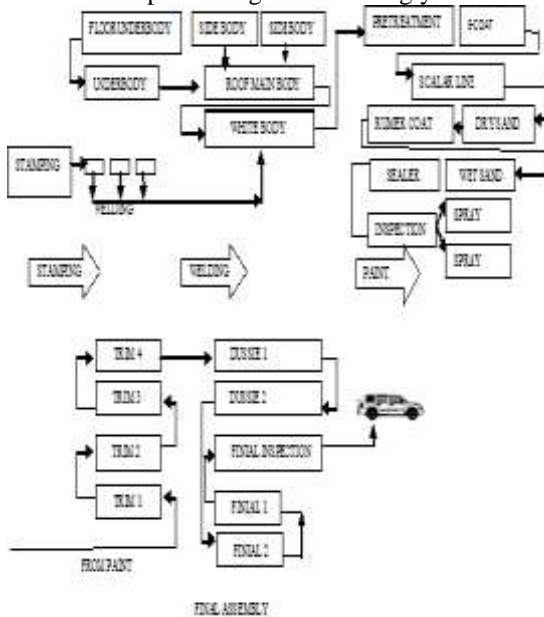

Fig4.Typical manufacturing process of cars

The planning algorithm also has been implemented.This uses decision making, that decides what to do ?The expert system drives the robotic arm by strips planning,it consists of an initial state and then a goal state.The sequence of actions is called planning.Here ,the sequence of action concerns assembling of various parts.An example of planning algorithm has been shown in the below figure,
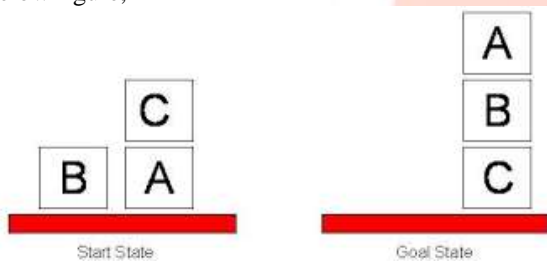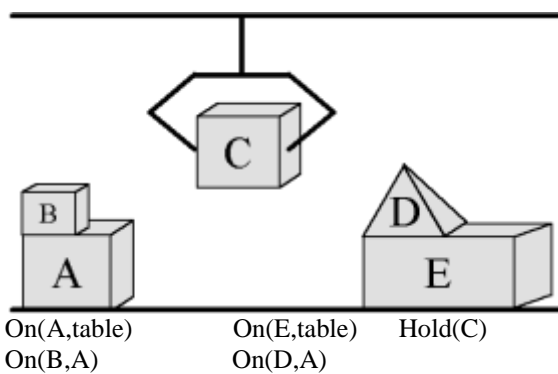

Fig5.Example of planning algorithm

On(A,table)   On(E,table)   Hold(C)
On(B,A)   On(D,A)

Fig6.Goal Oriented Action Planning

Speech
recognition

Fig7.working of robotic arm

D.Hardware specification

The module consisting of IOT,Arduino for control and relay for driving of the arm.The interfacing consists of IOT with Arduino where the input voice command is transformed to binary form by IOT module .IOT consist of GPS for obtaining of voice signal from server.Then, the Arduino converts the form to Pulse Width Modulation known as PWM.The input is then fed into the LCD,that is a (2,16)module.This then drives the robotic arm.

The IOT consists of sensors,converters, memory management modules that inputs the given sound signal then it is read in the binary form to the arduino.The arduino is programmed for driving the loads which reads the input signal and the digital write is performed with an LCD module.The serial communication takes place for transfer of data by the transmitter ports.Potentiometer convert ac to dc and then the PWM will be given to the relay where the relay drives larger parts with a robotic arm like wind shield, bumpers, headlights, doors, AC condensers, tail lights, steering wheel,window frame, wheels and this is done by automation .

E.Cognitive working

The process involves less time consumption which is one of the basic needs of the automotive industry in manufacturing.The space saving system to implement voice control for assembling and handling of parts is implemented.

The construction by performing tasks on vehicle frames, underbodies of the vehicle can be done without reprogramming by the robotic arm.It also handles different size of materials.Hazardous vapours and chemicals can be easily handled by this system.Size,slipperiness,flexibility,sharpness can be handled by this robotic machine.

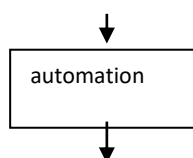## V.   SYSTEM IMPLEMENTATION

The complete design of the system is implemented by providing the user, the authentication and control of the robotic arm for the manufacture of cars without any requirement of manual effort by the human.

A.car manufacturing

The machine learning process has driven the automated manufacturing. With various process and states the next action can be determined during manufacturing.

The functional requirements are analysed at first by the DFA process.The parts are identified and determined for handling ,the data of the required part has to be analysed by a datasheet.Essential and nonessential parts have to be identified.Parts are being assembled and each part is assigned a number.For example, the wheel in a car consist of coilspring, lowerarmcontrol, strutassembly, bushings, steeringknuckle which has to be numbered and identified.
The car parts are being assembled say for instance ,we command assemble part 1 ,2 and so on.The expert system uses planning algorithms to make decisions based on the required part ,sensing uncertainity and sequential decisions are made.The CAD tools provide a geometric model for the design which is then implemented into a module.The configurations are specified,it is then brought into a hierarchial model.Cars can be specified the color ,size and various designs, then any type of it like jaguar,Maruti ,Volvo ,Audi can be designed.

automation

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┌─────────────┐
│ assembling  │
└─────────────┘
       │
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┌─────────────┐
│manufacturing│
└─────────────┘
       │
       ▼
  Final module
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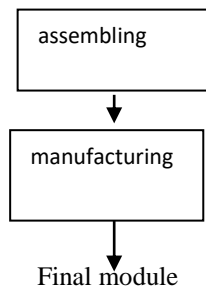
Fig8.Process flow

A windshield today is installed by robots in comparison with windshield installation by humanhand before.Nowadays ,the installation happens by robots for the manufacture of cars.Here,we use a voice recognition system for the purpose of command and installation in this context.

First of all the user needs to command ,this command is then driven to the voice recognition module,it activates the robotic arm for installation of the assembling parts.

VI.   EXPERIMENTAL RESULTS

A cost effective approach for assembly and manufacture of a car has been proposed.As a result you can effectively automate the robotic arm by your voice command.In the manufacture process Design For Assembly(DFA) reduce product assembly cost and Design For Manufacture(DFM) reduce the overall part production cost.These are together referred to us Design for Manufacturing and assembly(DFMA) in the basis of manufacture of parts.Here, automation process has been introduced with recognition process for performing the fitting of modules.

The system ensures construction and specification according to user needs.Even an untrained person will be able to automate the working.You can require less people for a start-up company without much training and handling skills.Any hazardous delay can be avoided..This ensures safety measures such that only the authenticated person can use to drive the load and can avoid from any misuse or theft of profit for a larger organization.

VII.   ADVANTAGES

- The proposed system can organize the work of manufacturer to increase the productivity of the user.
- Material handling issues in the automotive industry continue to have a significant bottom-line impact for manufacturers.
- This is especially obvious now with smaller production runs and a greater variety of car models being manufactured at any one time
- Robotic systems include automated systems for press unloading, stacking of the car body parts and multi-position handling of engine blocks, that is loading and unloading engine packages.
- The proposed system can safeguard in dangerous environments.
- There are two strong reasons why Hidden Markov Model is used. First the model is very rich in mathematical structure and hence can form the theoretical basis for use in a wide range of applications.

VIII.   CONCLUSION

In this paper ,we have introduced the voice recognition concept for easy identification and assembly of parts for automotives such as a car.The system is suitable for real-time implementation of manufacturing process.The system may be employed in industrial uses for manufacturing process of various other model of cars like Volvo,audi,jaguar and many other.

Human work in the car factory is becoming a matter of supervising robots and other machines.New manufacturing techniques automatically integrate robots increasing use of robots and related automation in automobile industry, the "drivers" continue to be increasing the labor costs where robotic technology price decreases and the ever-difficult shortage of skilled labor.Remarkable ease of use is that new robotics technologies offer to the end user making the decision to use robots easier than ever robotic technologies and can have a profound impact on industrial vehicles.

IX.   FUTURE APPLICATIONS

The various future applications can be used to produce different types of vehicles and for automating the manufacture of vehicles. Information and communication technologies are rapidly converging to create machines that understand us, do what we tell them, and even anticipate our needs and also speech recognition system improve customer services.Some more new facilities can be introduced in the design of automation of vehicles.

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