Low Cost Personal Digital Assistant with IoT and Wsn Capabilities

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Abstract - *An Personal assistants are everywhere, may be in our android mobile phones, in websites we browse and some physical devices such as Amazon's echo, google's assistant and more. These digital assistants offers a vast range of services like news updates, weather, sports, online wiki information and more through voice interaction of by GUI. Each device or service has its own capabilities and limitations. For example we can get temperature in a area which can be available on the internet(obtained by weather stations) but we can't control an air conditioner based on area temperature, we need to know room temperature for this. Like this all the digital personal assistants works on predefined algorithms which can collect the information from the online sources or their cloud databases. Hence in order to increase the capabilities of DPAs here we increased the man machine communication through some sensors like temperature sensor, camera etc., and the virtual assistant was developed using Google's voice API on raspberry pi3 board. And we used a cloud service amazon web services (AWS) to analyse the captured image and sends back the results to the personal assistant. This feature can be used in security services and image recognition. All the possible features of this DPA are given in this paper.*

Key Words: PDA, Google voice API, AWS, Machine learning, Raspberry Pi3, Temperature sensor, Camera module, Text to Speech, Voice control.

1. INTRODUCTION

Artificial Intelligence causes us play out the undertakings in our everyday life, settling on choices and finishing our day by day errands. This makes A.I. a ton mainstream nowadays.

They can be found wherever in our environment. Have you at any point played computer games? The vast majority of the individuals would have. In each cutting edge computer game, every one of the characters have artificial intelligence which enables them to pursue the fundamental player, assault and battle naturally without human cooperation.

Another well-known case of artificial intelligence is an extortion recognition framework. Ordinarily we get phony messages, for example, login to bank, charge card security, and so forth. These frameworks investigate messages and numerous banks have security techniques which counteract burglary of charge card subtleties, and so on.

A virtual assistant, additionally called AI assistant or digital personal assistant, is an application software program which understands natural language voice directions and completions assignments for the customer.

Such undertakings, genuinely performed by an individual assistant or secretary, join taking translation, scrutinizing substance or email messages resoundingly, investigating phone numbers, arranging, putting phone calls and reminding the end-customer about plans. Surely understood menial helpers at present join Amazon Alexa, Apple's Siri, Google Now and Microsoft's Cortana - the advanced partner consolidated with Windows Phone 8.1 and Windows 10

Various devices we use everyday use, voice assistants. They're on our PDAs and inside splendid speakers in our homes. Various versatile applications and working structures use them. Besides, certain advancement in vehicles, similarly as in retail, guidance, therapeutic administrations, and communicate interchanges circumstances, can be worked by voices. .

I. SYSTEM ARCHITECTURE

A. Data acquisition

Data acquiring is the route toward looking at sign that measure genuine physical variables and changing over the resulting models into modernized numeric characteristics that can be constrained by a PC. The segments of information securing frameworks incorporate:

- Transforming physical parameters into electrical signals with sensors.

- Signal conditioning hardware, to change over sensor signals into a structure that can be changed over to computerized values..

- A to D converters, which are to convert conditioned sensor data to digital signals.

In this the data can be acquired by two ways to the main computer, i.e., raspberry pi board.

i. Image capturing

For image capturing here we used a camera and this camera was interfaced to the raspberry pi.

The Pi Camera Board connects legitimately to the CSI connector on the Raspberry Pi. It's ready to convey a

completely clear 5MP picture or 1080p HD video recording at 30fps. And the images are captured.

ii. Sensors

The environment parameters like temperature humidity co2 levels are measured with the help of supported sensors. here we used DHT11 for temperature and humidity, MQ-5 for LPG leakage, moisture sensor to measure water content for plants.

The DHT11 sensor can either be acquired as a sensor or as a module. In any case, the performance of the sensor is the same. The sensor will come as a 4-pin device out of which just three pins will be utilized while the module will accompany three pins.

A gas sensor is utilized to recognizes the closeness of gas in an area. This gadget related to gas to check its core interest. Each ga has a novel breakdown voltage, for instance, ionized electric field. The sensor distinguishes gas by evaluating these immersion voltages. The MQ5 sensor recognizes the closeness of various gases, for instance, hydrogen, CO, CH4, and LPG in the scope of 100ppm to 3,000ppm.

A sensor which measures the moisture content in the soil, is used in this project to look after the plants by the digital assistant. This moisture sensors gives the moisture content of the soil to the assistant, and based on threshold values it will automatically opens the watering valve if plant need water.

B. Output data

The results of the system are divided into three categories as device control, voice response and notification services.

i. Load control

We can control loads or electrical appliances like light, fans etc, with voice commands, by using google voice API. The integration of this API is done on the raspberry pi system. We can also connect these devices to google home kit for automation.

ii. Voice response

In response to the commands the system will give you voice response as well as the sensor data and the captured images everything will be given by the voice response from the system.

iii. Notifications

AWS also supports notification service known as SNS(Simple Notification Service) to get notifications in any situations. Notification includes Text messages, emails etc. we can configure the function for our required response.

C. AWS Services

AWS is the cloud service provided by the amazon company. With these services we can store our data in the cloud servers, manipulate the data and even we can use some machine learning tools. Some of those tools we used in our project. AWS gives access to those tools by pay for use policy. For up to some instance it is free. Rekognition, chatbots, S3 are some of the tools.
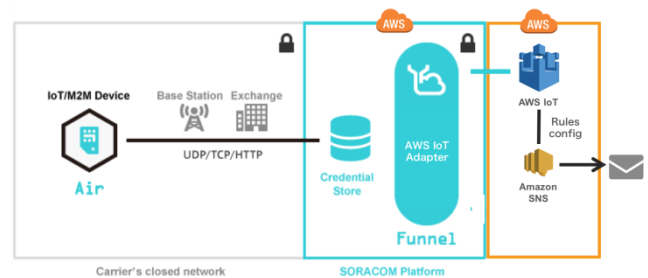

Fig1: AWS Flow

We can signup for free tier account in which we can use some services at free of cost up to some limit, after that they will charge the service based on execution time and memory space.

D. System components and tools

i. Raspberry pi 3

The Raspberry Pi 3 Model B is a small Master card size PC. Simply can be connected to keyboard mouse and display and you'll have a complete PC that can run applications such as word processors to games with linux distribution kernel inserted in a memory card.

And the specifications are:

- SoC type, Broadcom chip BCM2837
- 4× ARM Cortex-A53 CPU core @1.2GHz
- Broadcom Video Core IV GPU
- 1GigaByte LPDDR2 RAM
- Communication:10/100 Ethernet, 2.4GHz 802.11n wireless, Bluetooth 4.1 BLE
- microSD storage for files and OS
- 40-pin header for IO operations

- Ports: HDMI, 3.5mm analogue audio &video jack, Ethernet, 4× USB 2.0 ports, Camera Serial Interface (CSI), Display Serial Interface (DSI).

ii. Camera module

5Mega pixel camera designed for raspberry pi applications such as image and video capturing. This camera can be directly connected to camera interface port through ribbon cable. And there is also another camera which has 8Mega pixel resolution.

iii. Speaker and microphone

To get response from voice API and to give voice commands speaker and microphones were used in this system

iv. Electrical load to control

Typical electrical loads were tested with this system and they are working fine. The number of connected devices can be depends on hardware support.

v. Sensors

Several sensors like temperature, humidity, moisture, gas level are used to get the real world parameters. And in case of any abnormal conditions went on, the PDA will notify the owner with its notification service.

III. OUTCOMES

A. Object and scene detection

Here we taken an example of a traffic picture and the results are shown in the picture with confidence levels.

Fig:2 Normal traffic on road

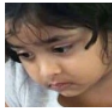| Results	
Building	99.9 %
Urban	99.9 %
Road	99.9 %
Street	99.9 %
Town	99.9 %
City	99.9 %
Person	99.7 %
Human	99.7 %
Neighborhood	91.5 %
Transportation	89.9 %
Vehicle	89.9 %
Pedestrian	85.9 %
Car	85 %
Automobile	85 %
Motorcycle	78.3 %
Sedan	72.7 %
Moped	70.6 %
Vespa	70.6 %

Fig 3: results

B. Facial analysis

Fig 4: child with sad face

This picture is about the face and the expression of the child. PA will examine the picture and tells us the below.
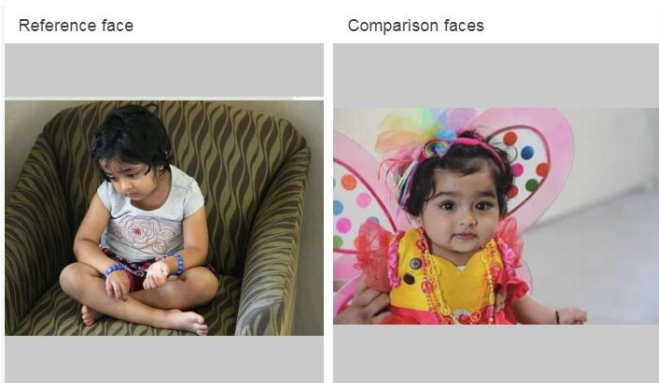
Fig 5: results

C. Image comparison

Fig 6: face comparison

Fig 7: results

The given will be processed and compared with the pictures present in the data base and shows the similarly rating.

D. Celebrity recognition

Taken an example of a person.PA will process the picture and it will whether the person present in the picture is celebrity or a common person.

Fig 8: celebrity recognition
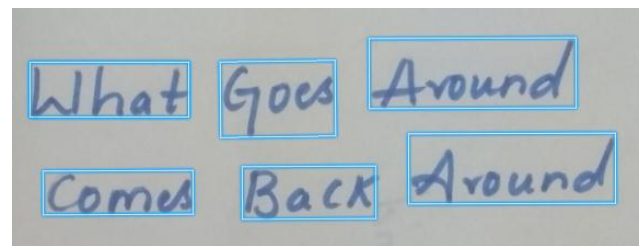
E. Text extraction

Fig 9: Text in a picture

PA will process the text from the picture and it will show the text, which is useful in many applications.

Fig 10: results

F. Monitoring Emergency Conditions and Notifying

- Fire accidents detection.

- Missing child and people detection.

- Weapons detection.

- Home security with face detection.

IV .CONCLUSION

By this implementation we can easily improve human machine communication and ass well as the digital personal assistant qualities can be improved effectively by employing sensor network elements. We can develop our own algorithms to develop prediction based applications by analysing the uploaded data to the AWS server.Video analysis can be done and live video analysis will be more useful for security applications.

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