SIMULATING (IPAs) INTELLIGENT PERSONAL ASSISTANTS BY AMBIENT INTELLIGENCE

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Abstract: Ambient intelligence is one among the new discipline that makes things around us to be intelligence and makes the environments more sensitive to us. Since it is an intelligent system it will be more interactive to the humans which also becomes a key part in the environment. This Ambient Intelligence largely depends upon the combination of technologies such as Pervasive computing and ubiquitous computing which is possibly connected to the network, as well as on the intelligence of the system which is used in the implementation part. The aim of this paper is to describe the characteristics and application of Ambient Intelligence, to produce samples of their applications and to quote the innovations that lies ahead in society for the implementation of this virtual assistant concepts in the environment around us. Specifically we tend to target on the analysis and development that makes AMI technologies “intelligent”, such as computational intelligence and the verbal intelligence which plays a major role in day to day life in which we are customizing the intelligence with respect to the environment to which it is implemented.

Keywords: AMI- Ambient intelligence, Pervasive computing, Ubiquitous computing, Intelligent Personal Assistant.

1.INTRODUCTION

The European Commission's on Information Society Technologies Advisory Group (ISTAG) [2] introduced the concept of ambient intelligence. Basically, AMI refers to a digital and smart environment that actively, and sensibly, supports people in day to day activities. IEEE Intelligent Systems was one of the first technical publications to emphasize AMI's importance, with Nigel Shad bolts editorial in the July/August 2003 issue. Other concepts such as ubiquitous computing, pervasive computing, context awareness, and embedded [1] systems that is overlapped with AMI, but there are distinctive differences between them. Networks, Sensors, Human Computer Interfaces (HCI), Pervasive Ubiquitous Computing and Artificial Intelligence (AI) [3] these are all relevant and interdependent groups but none of them conceptually covers the full scope of AMI. Ambient Intelligence is one of the mechanisms that rule environment over its smartness, the definition which is given above includes the need for a “sensible” system, and this means a system with intelligence. In the below flow diagram it starts with a hardware which is processed by a knowledge based computer which then passes it to a network, commonly known as agent. The output will be attached to a web based system like Internet of things and it ends with an ambient.

We can broadly classify the contributing technologies of ambient intelligence [6] into two major computing techniques namely pervasive computing and ubiquitous computing which is an emerging computing technologies in information processing and computing techniques prevailing now which will be elaborately discussed below.
2.1 UBIQUITOUS COMPUTING

The ubiquitous computing just revolutionize the technological world of an individual. The general working meaning of ubiquitous computing innovation is any figuring innovation that grants human communication far from a solitary workstation. In its definitive shape, universal figuring implies any processing gadget [1], while moving with humans, can assemble steadily powerful models of its different condition and design its administrations in like manner.

So the ubiquitous computing [7] is often considered as a successor to mobile computing since it involve wireless communication and networking technologies, mobile devices, embedded systems, wearable computers, RFIDtags, middleware andsoftwareagents. Inter net capabilities, voice recognition and artificialintelligence are often also included. Finally the ultimate goal of ubiquitous computing is to make devices smart thus creating a sensor network capable of collecting, processing and sending data, and, ultimately, communicating as a means to adapt to the data's context and activity; in essence, a network that can understand its surroundings and improve the human experience and quality of life.

2.2 PERVERSIVE COMPUTING

The term pervasive says "existing everywhere." Pervasive computing systems are well connected and consistently available. In computing terms ubiquitous computing and pervasive computing seem like similar concepts. Ubiquitous computing would be everywhere, and pervasive computing would be in all parts of your life. Pervasive computing makes a subtle domain with full and coordinated Internet availability.

The main characteristics of pervasive computing is physical imparting and instantaneous interaction. Physical imparting is the communication between the computing devices with the outside world that is the surroundings. Also Pervasive Computing is related with all the physical parts of our lives, the user may have not notion of the computing devices and details related with these physical parts which is also one of the important merit of the pervasive computing. Now the ideology of pervasive computing can be applied in any modern day devices for an efficient working rather than applying the normal computing techniques. So some of the real time applications of pervasive computing techniques [7] are smart homes, smart cars and different smart codes. Also the pervasive computing provide its applications health care sector also. In local and remote villages the pervasive computing can be used to facilitate specialized health services during the time of emergency. Thus this type of computing technique also provides a pervasive environment for E-Health sectors and applications. So the pervasive computing makes the human life simple by combining the computing devices and its applications with everyday activities. Thus pervasive computing has started becoming a segment of an individual’s everyday life.

3. SYSTEM FLOW

An AMI system can be built in many ways. Typically it needs sensors and devices to surround occupants of an environment (interacts) with technology (we can call this an “e-bubble”). The technology can provide accurate data to the system on the different contexts which are continuously developing. The data collected is transmitted by a network and pre-processed by middleware, which collates and harmonizes data from different devices. In order to make decision-making easier and more beneficial to the occupants of the environment the system will have a higher level layer of reasoning which will accomplish diagnosis and advise or assist humans with responsibility for intervention.

![Flow Diagram](image)

A typical information flow for AMI systems is depicted in Figure 2. AMI systems with the general architecture described in the previous section can be deployed in many possible environments [8]. The sensors are embedded in the environment where it collects and passes inputs from the middleware that is the individuals present in the environment. From the obtained input passed to a processor which in turns connects to a knowledge repository for computation where the input elements that may be included in the high level Decision Making' processed through a 'Knowledge Repository' where the events are collected and processed to take decisions and to compute. From the output the computer adapts and learn through the environment. Then the result is passed through the middleware. This happens in a continuous loop format until it receives the input from the individual. Thus the environment and the human or individual, they both are sensitive to each other which is a sign of a good human-computer interaction.
4. ADVANTAGE OF AMI

- Learn the behaviors of the individuals living in the environment
- Consider the regularities and patterns of each person, such as personal hygiene, sleep, eating etc...
- Easy access to data’s and the ambient environment.
- Computing starts in the ambient environment with integrating artificial intelligence makes the smarter environment.
- Additional sensors or other required facilities can be added readily by integrating to the hardware.

5. APPLICATION FOR AMI

The Ambient Intelligence finds its applications in many sectors in which in intelligence such as linguistic, computational and natural language processing. Some of their applications as follows:

- Health-related applications:
- Public transportation sector:
- Education services:
- Emergency services:
- Public Surveillance:
- Advance Applications:

Nowadays, machine learning is widely used, so AMI will likely also need to handle this technology. One requirement for AMI is to learn by observing users. Several systems understand user commands, but they're not intelligent enough to avoid doing things that the user doesn't want. Basic machine learning methods will enable AMI systems to learn by observing users, thus making these systems more acceptable to them. As we mentioned before, automated devices such as robots could perform actions. Cognitive-robotics research can provide benefits for AMI environments such as smart homes. This is especially true when persons live alone, are elderly, or have health problems. The creation of intelligent robots that can perform several tasks or just act as companions is important. More likely we intend to create a new technology by the means of the collaboration of the technologies like ambient intelligence and virtual assistants.

6. ALGORITHM

// customizable virtual assistant for commercial purpose and household purpose.
Input: query as voice
Output: appropriate result of the query as a virtual voice.

1. Setup the environment and import the package.
2. Define a function for speech recognition and set it for ambient noise.
   RECOGNIZER.ADJUST_FOR_AMBIENT_NOISE()
3. Setup a key for starting the program
   IF (key==input): start the program
4. Ask for the input query through SPEAKER.SPEAK () method.
5. Get user input by calling RECOGNIZE_SPEECH_FROM_MIC ()
   IF the speech is recognized move to step 6.
   ELSE add the exception and move to step 4.
6. Pass the query to the wolfram alpha and Wikipedia and get the results through:
   WIKIPEDIA.SUMMARY (), WOLFRAMALPHA.CLIENT ()
7. Pass the results to the SPEAKER.SPEAK () method to get the virtual voice.
8. Repeat the process until IF(input != shutdown) ELSE exit the program.

7. IMPLEMENTATION OF SMART ENVIRONMENT

A typical Ambient intelligence system can be built in many ways which depends on the ambient environment in which is begin applied.

This system can be readily placed or kept in environment where it interacts with the user who is present in the environment and above all we have developed a complete application which shows or exhibits how this typical system works, and this system developed in python where the below (Fig.3) shows the architecture in which it is developed.

![Fig.3 system architecture](image-url)

In above diagram we get a clear view of how the system is built, its starts with the Input which the Speech Recognition This is done while a help of a package which coordinates with the Google and produces the result, below shows us the coding snippet for speech recognition which is done by the help of speech recognition and pyaudio.

```
with microphone as source:
    recognizer.adjust_for_ambient_noise (source)
    audio = recognizer.listen (source)
    response ["transcription"] =
        recognizer.recognize_google (audio)
    recognizer = sr.Recognizer()
    microphone = sr.Microphone()
    my_input=recognize_speech_from_mic(recognizer, microphone)
```
then the input is passed for computation which is done by
the help of the Wolfram alpha, which is a data resource
center and also provides a computation power for our
system where we have get a privatize API (Application
Programming Interface) key to access their services. Then
the in some cases the Input will be of raw and not a process
able one so in cases we are using an Information retrieval
pattern where the input is passed and its meaning or relative
answer for the input is obtained as the results, below shows
the coding snippet for the processing the query through the
computational sources like wolfram alpha and Wikipedia.

```
""" app_id = "XXXXXXXXXX"
c = wolframalpha.Client(app_id)
result 1 = c.query (my_input1)
result 2 = wikipedia.summary(my_input1) """
```

This thing is very base one with the primitive work flow and
it has enough structure which is a good example for
showcasing the flow present in the process, this Ambient
Intelligence can be further more made in advance by
incorporating it with additional electronic sensors and
actuators which can be embedded in the ambient
environment and the inputs from those sensors are also
processed and computed for the user.
The output to the user is obtained according as per the user
wish be it in a digital display or any virtual devices. For
example, here I have used a virtual voice system with
win32com.client package and the coding snippet for it is
shown below,

```
""" speaker = win32com.client.Dispatch("SAPI.SpVoice")
speaker.speak (" your result ...") """
```

One of the main concepts of this AMI is these system
can be programmable to the environment in which they are
being applied i.e. they are customizable and can fitted to the
environment. We have also done a model to show how these
things can actually help us in the real life oriented
applications.

SAMPLE OUTPUTS OF A SMART ENVIRONMENT

```
How do I help u :
You said: shutdown
Thank u
```
(Note: sample output is taken for documentation purposes
the actual output is completely virtual)

8. A CUSTOMIZED SMART KITCHEN

To create a typical smart kitchen we need a similar
architecture for its software development where the input
from the user is got in the initial stage then the input query is
processed by the system and the output of it is thrown at the
d to the user who is present in the ambient environment.

To start with, We will be using the same input format that is
speech recognition as our input type and the query is passed
processed by the similar methods where there will be an
active databases or memory elements which is present
virtually some ware else or in the hardware where the
software is to be embedded. Then the output for the query
made is processed and given to the user.

In this case of a smart kitchen we have some ideas where it
makes a normal kitchen to be a smart kitchen. Consider a
situation in which you are in state where you have to cook a
dish which you did not known, this can be solved with a
smart kitchen where the virtual thing present in the kitchen
is helpful in the instructing you to cook the dish which you
want to cook and also consider a state where you want to
use a thing in the kitchen where you don’t know where is it.

So, to solve this we can insert all the information we need in
the database or in a typical cloud storage like amazon s3
bucket and you can privatize it, where we establish a
connection in between the storage facility and the program.
Where it acts as the computation center to process our query
below shows the coding snippet for data retrieval for
MySQL data bases.

```
""" connection = pymysql.connect(
    user="user_name",
    password="XXXX",
    db="db_name"
) 
sql = "your sql statement or query 
```

SAMPLE OUTPUT OF THE SMART KITCHEN

```
How do I help u :
what are the dishes available
[{'dishes': 'noodles'}, {'dishes': 'sam'}
```
(Note: sample output is taken for documentation purposes
the actual output is completely virtual)

9. DISADVANTAGE OF THE SYSTEM

• The real implementation of this system is to be done in
hardware and so far there is no such a specific hardware is
designed for this system rather than rassberry pi.
• Input intake of this system (i.e. Speech Recognition is to be developed more to get the accuracy of the speech spoken is to be done).
• A good internet connection is need to retrieve the data’s and time of retrieval is also a matter of concern in the system.

10. FUTURE ENHANCEMENT

Since the main aim of this AMI is to make an intelligent environment which can be customized and utilized by the user. In order to place it in a larger scale we can choose cloud storage and also cloud computing as our platform to do this and we can also embedded our own hardware to run this project to make the software more comfortable. Furthermore with a developed level of this software can be embedded in the hardware such as ROBOTS which is actual future goal of the smart and intelligent environment.

11. CONCLUSION

Virtual assistant eventually gives the control to the individual by making the environment more responsive to their actions and needs, thus reducing the physical power that is required to perform a task. So ambient intelligence is an emerging confluence of topics that can converge to satisfy the technological needs of a society. Hence as a generic statement we can say that AMI is the advanced emerging discipline in the upcoming technology era. By which, it is possible to create or to transform the existing environment into an intelligent environment.

ACKNOWLEDGEMENT:

We wish to thank Mr. Emmanuel of ECE department for their encouragement and support of this Paper. We are also grateful for their assistance with the production of this paper. Many thanks go to the contributors of the chapter. Their active and timely cooperation was a great thing for us.

REFERENCES:


