

# Internet of Things – Paradigm Shift of Future Internet Application for Specially abled Person in Everyday Life

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*Abstract*— In the world more than 15% people are living with disability that also include children below age of 10 years. Due to lack of independent support services specially abled (handicap) people overly rely on other people for their basic needs, that excludes them from being financially and socially active. The Internet of Things (IoT) can give support system and a better quality of life as well as participation in routine and day to day life. For this purpose, the future solutions for current problems has been introduced in this paper. Daunting challenges have been considered as future research and glimpse of the IoT for specially abled person is given in the paper.

**Key words:** Internet of Things (IoT), Specially abled person, Obstacles, Research, Solution, Application of IoT

## I. INTRODUCTION

The World is becoming smarter because use of the Internet of Things(IoT) like smart home, smart education, smart services, Internet of things (IoT) is being a game changer in the life of human beings and it is also making life easier and better. In everyday life we can adopt many smart devices and make things simple but to solve problem of specially abled person if we can invent few IoT devices then it would provide Technological strength to them. In Large Scale we can give solution in the area like transportation, health care, education and Training and Day to day activities.

According to the 2011 census report given by government of India, 20.3% of the disabled are movement disabled followed by hearing impaired (18.9%) and visually impaired (18.8%). Nearly 5.6% of the disabled population is mentally challenged.[1] And in the world 190 million people are having severe disability ( World Health Organization report 2011) like quadriplegia, depression and blindness.[7][10]

The Specially abled people often needs someone for their routine life. Even in some cases they are not able to call someone for help. Having been faced such type of critical situations they are demotivated. Assistive IoT technologies are incredibly powerful operations to enhance independence and increase participation. The Internet of Things can offer assistance and system that they needed for achieving a better quality of life and it also gives them opportunity to participate in regular life.

## II. IOT LAYERS

IoT layers are divided in to three parts and their functionalities are given below:

### A. Perception Layer:

It identifies objects and collects useful information. It is made commonly by cell phone, tablet PC, sensors, P.D.A etc. It also includes RFID tags, Zigbee tags and readers or writers.

### B. Network Layer:

This layer gives access of monitoring station to the radio channel to transmit the gathered information which is obtained from the above layer. Wireless and Ad hoc networks are good choice to connect wireless and mobile communication within the IoT, though they do not depend on current infra structure they need some configuration and they can be deployed with low cost.

### C. Application Layer:

It is a Solution for applying IoT technologies in a intelligent way to satisfy the requirements of the users. This layer gives an operation support platform which can be delivered with monitoring stations and devices. It provides main functionalities like authentication, service management, service acceptance and routing of packets[6]

In the application layer the services are controlled by application servers which executes as well as host the services and gives the platform to communicate with the support system. The RFID (radio frequency identifier ) application server is useful in the application for blind which will work as a navigation system . When the user is not having idea about destination then RFID tags will be helpful to find the original path and it can be useful in avoiding non-encrypted links.

### III. APPLICATION OF IOT

In this section applications of the IoT for specially abled person is being discussed. They described interaction of different parts of IoT layers.

#### A. Identification of Objects:

The people with visual disability can identify the objects with use of RFID tags. The blind navigation system provides a significant way in a grocery store to find objects.

The store's RFID system will be used in software to guide the user for identifying the objects. RFID tags are labeled through the floor of shops. The tag IDs within a cell are correlated for navigation like type of cell as well as its neighboring cells. The station connects with RFID reader to keep track of users position using the tag ids and navigation information.

The voice synthesis helps for reorganization of different sections and objects where the user wants to go the route that is followed by user can be tracked via WLAN which is connected to the internet. For example, when the user walks through the routing direction an android application will receive the directions and voice messages will be played through the headphones.

User will get information like Name of the Object, description and price through RFID tags. The tag reader delivers the tag ID string to the monitoring station which will be forwarded to the RFID server. In case of cache miss, the smart phone communicates through GPRS with a remote server or, in case of miss, with a public Universal Product Code (UPC) or RFID database, which converts the barcode or tag into a human interpretable product name (and related information) and returns it to the smart phone.

An onboard text to speech software in the smart phone converts the text received from RFID database to speech. The advantage of RFID tags are that it can be read without having line of sight.[12]

A hand glove with vibrating motors and the audio of various devices are used for guiding the user. Automatic payment will be done by RFID. A scanner will read all the items sum up the price and charges will be detected from the account of user. RFID credit cards will be used for sending personal and financial data.



Fig. 1: Objects Identifications

#### B. In Education Field:

RFID tagged toys are used to help deaf kids which are below five years and it will be helpful for learning sign language. The software will help the child to use RFID reader for scanning items tag and it will identify the unique number which will be sent to computers software with the help of any USB connection. An animation language could be develop for the child to familiarize with many versions of object. For example, bilingual approach can be used for learning common objects. Other then this RFID tags or readers are more appropriate then barcode.

Currently the information of objects is stored in a computer or storage devices although RFID data bases or servers will be more efficient then other devices. We can also give the same technology to zoo or farm visits where user with tag readers can learn the concepts while looking at animals and plants rather than plastic models.

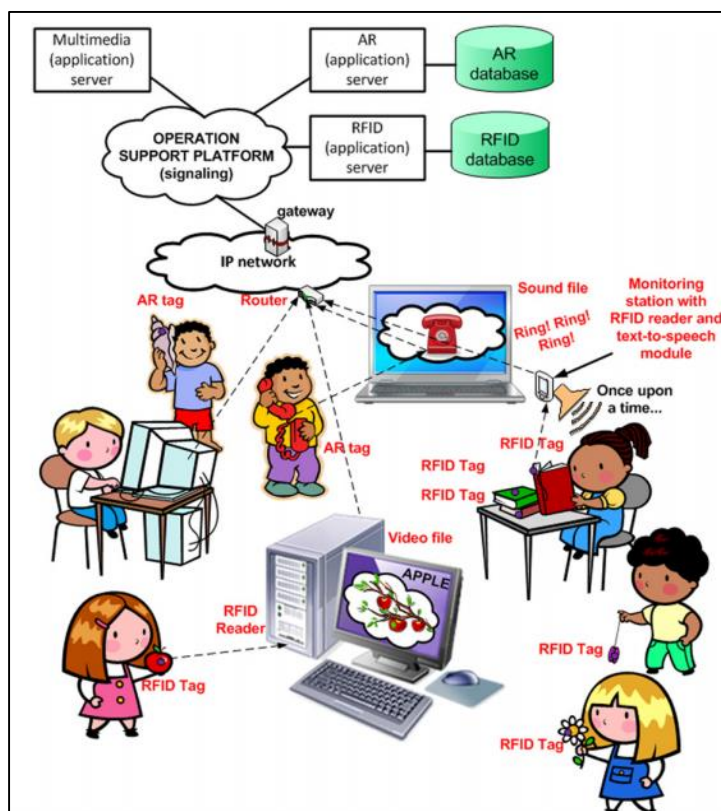


Fig. 2: In Educational Field

With help of augmented reality real world and computer generated scenes can be combined. For example, A picture card will contain an A.R tag which will be helpful for merging virtual sound with real imaginary. In addition children with visual disability can locket various books using RFID technology and can read with help of text to speech module. [11]

### C. Smart Home:

Smart home technology is integration of technology as well as services provided by home networking and WLAN for good quality of living.

Domestic environment can control automation of different environment using equipments like light and door controllers indoor temperature controllers, home security tools and water temperature controller. To monitor the environmental and physical conditions sensors are processed for collection of information with other units and wireless network. This information is processed for providing appropriate services to the user. If alarm condition will be detected then burglar of fire will be initiated.

The same system can be applied to home washing control and cooking different dishes in the system the mount of dirty cloths detected by RFID tag will automatically send to the user and it will check the energy aware washing program. For compatibility between cloths when the washing machine is being loaded.

Other smart home applications can be used as fridge and shelves communication to a master reader in the kitchen for suggesting cooking recopies with the reference of users choice and health condition.

The smart home server and database are also useful for record of required food items and current availability of items compared to shopping list.

An automation logic for optimizing the power consumption and the whole day can be developed and the price of electricity can be obtained from an web services.

Modern smart houses can be useful for resolving social isolation of disabled people and it can be done with different ways which are given below:

- Specialized interfaces
- Special devices for improvement of living condition at home

#### 1) Specialized Human Machine Interface (HMI):

It refers to the operational subsystem to control home equipment like lamps, TV sets, doors, etc.. Specialized zooming devices (both optical and optoelectronic) allow people with low vision to control the home environment. A retinal prosthesis can also enhance their vision. Voice control of home-installed devices is also a proper method.

#### 2) Hearing Impaired People Require:

##### a) Specialized HMI:

Touch screens to access graphical information and read text. Assistive devices for deaf are helpful .

Physically impaired people require:

##### b) Specialized HMI:

people affected by serious paralysis can use head-tracking devices to produce up to three independent proportional signals. Other techniques involve facial detection, eye-movement control, brain control, gesture recognition and facial expression

recognition. An intelligent wheelchair is proposed; it determines its direction based on the inclination of the user's face and is stopped depending of the shape of the user's mouth.[2][3]

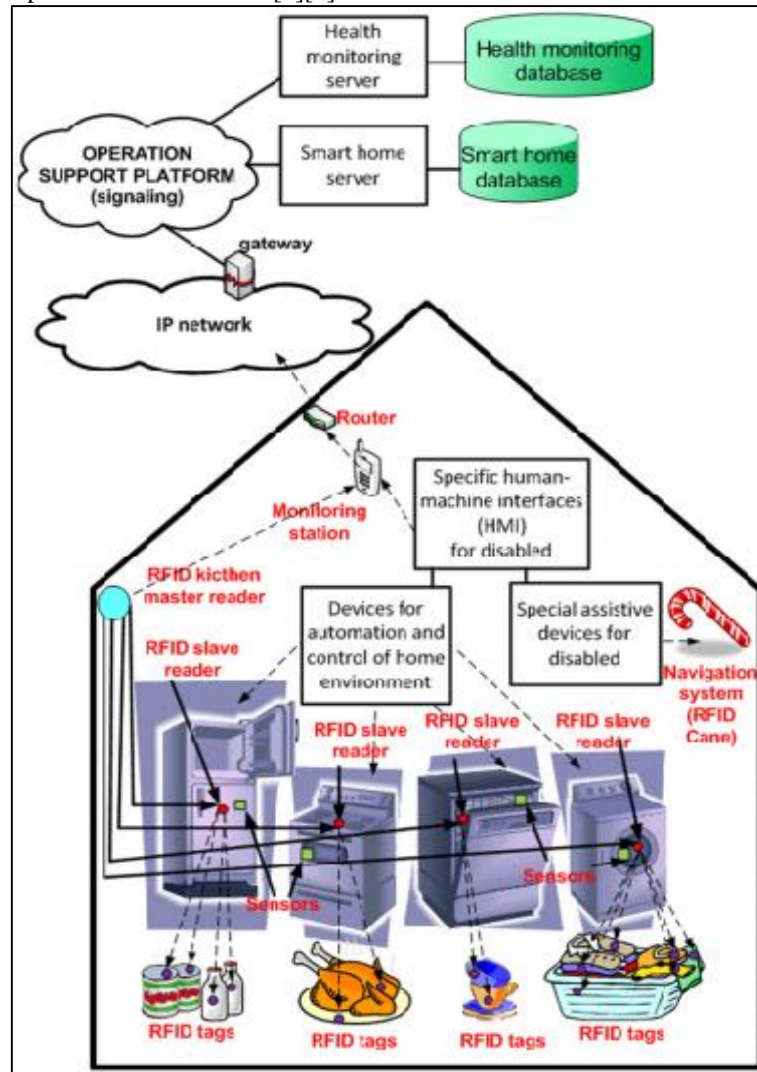


Fig 3. Smart home

Some examples of special assistive devices required to assist disabled people in improving their living conditions at home are summarized as follows:

3) *Visually Impaired People Require:*

Devices for indoor navigation: a navigation system and an obstacle detection system based on voice-synthesized instructions are valuable.

4) *Physically Impaired People Require:*

Electro-mechanical devices for movement assistance: typical devices include powered wheelchairs and specialized lifting devices to transfer the user between the bed and the wheelchair. A two-wheeled wheelchair able to lift the front wheels (casters) to achieve an upright position has been designed. This way, the disabled persons who cannot stand on their own can reach certain heights and are able to pick and place things on shelves.

5) *Robotic Systems for Movement Assistance:*

rehabilitation robots are designed to assist individuals in their everyday needs, such as eating, object replacement, etc. The method for bathing care assistance using the robot suit HAL is introduced.[4][9]

#### IV. ADVANTAGES OF IOT FOR SPECIALLY ABLED PERSON

IoT applied to smart homes or smart devices makes it easy for specially abled person for carrying out their day to day activities. After applying IoT human machine interface for communication will be easier and a strong correlation between deaf children and their academic achievement can be developed.

The IoT will create environment of access of transportation, information and communication to specially abled people. Furthermore monitoring systems improve the autonomy of Specially abled person because they reduce or dismiss control visits of caretakers.



## V. CHALLENGES

A key challenge in this idea is customization of devices for people with special needs. If the user is returning the books in library, there should be a way to orient the user that can provide a path for returning the book or else we can say the access area where the return box is located. Another challenge is self-management which cannot be possible with specially abled person. It also requires self-configuration, self-healing, self-optimization etc.

Another important challenge is standardization. It is very hard to achieve because of technical as well as environmental conditions. And more research should be adopted for existing protocols or new solution.

## VI. CONCLUSION

In this paper glimpse of the IoT for people with special needs has been concluded. The relevant examples as well as solutions has been elaborated. Challenges and possible solution are also served to the highest level. The research is widely open for future purpose.

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