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Applications of Ambient Intelligent Systems

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***Abstract*—**This research paper discusses the different applications of Ambient Intelligent Systems in various industries.Expect exciting, interesting, and amazing applications of this innovative technology such as by gesture a person can command the television to be brighter, call an ambulance automatically based on the data collected by the wristband or other wearable devices worn by the patient at home, automatic driving, generate electricity using the body heat and keep wearable medical devices always charged.

Keywords*—Ambient Intelligent Systems; Health Care; Smart Environments; Sensor Networks;fall detection;applications of ambient intelligence; pervasive computing*.

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I. What is Ambient Intelligent Systems and why is it Important

Ambient intelligence (AmI) in computer science means a group of electronic devices in an environment where all the electronic devices are connected to the Internet and are sensitive and responsive to the presence of people. The most common example is the automatic opening and closing of doors at the main entrance of offices and shops when someone stands in front of the door, automatic switching on off the lights, automatic dialing of the intercom number by the connected devices simultaneously. The Ambient Intelligent System energizes smart environment and activates pervasive computing.

Ambient Intelligence Environment (AIE)is aware of the presence of people and context and is sensitive, adaptable, and reactive to their needs .To address the needs of a person using the AIE ,the current local whereabouts of this person must be known and recorded to provided location-specific services to the person. It is not advisable to use cameras in AIEs to protect the privacy of the users, instead use of nonintrusive sensors is recommended. For outdoor spaces, localization means which rely on satellite signals triangulation are popular currently. The outdoor localization means cannot be used in indoor environments.

Most of the nonintrusive and non camera-based indoor localization systems need you to install additional hardware such as radio-frequency identification (RFID) antennas, ultrasound emitters and antennas, and so on. The AIEs plays an important role, especially, in health and safety of the elderly and patients.

Visualize a day when a tiny smart device monitors the status of your health continuously and performs diagnoses of possible health conditions .The devices might also interact with you such as the personal trainer to convince you to alter your lifestyle for improving your health. It might also interact with your doctor if required. These devices are implanted into your cloths and contain very tiny sensors. They might even interact with other smart devices around you to monitor your food habits and lifestyle at home or office. For example, these devices monitor the lack of a healthy diet based on the things in your fridge and based on you regular outdoor eating habits.

The traditional input and output media does not exist in the Ambient Intelligent System .The sensors and CPUs are integrated into everyday objects. They interact with each other to support the residents living in these computing environments. The Ambient Intelligent System interprets contextual information received from embedded sensors using different artificial intelligence techniques .It helps in changing the environment as per the requirements of the users in a clear and predictive way. An Ambient Intelligent System is known by the following characteristics:

Context Aware: It manipulates the contextual and situational information.

Tailored: It is modified as per the requirements of every user.

Anticipatory: It can foresee the needs of a user without the need for the user to directly interact with the system.

Predictive: It adjusts to the changing requirements of people.

Universality: It is implanted and merged into the everyday environments of the users.

Transparency: It fades in the background of our day-to-day life in an unrestricted manner.

An important feature of ambient intelligence is intelligence apart from these list of characteristics. The system can become more adjusting, responsive ,sensitive, and universal by using

the innovations in artificial intelligence (AI). An Ambient Intelligent System uses reasoning, activity recognition of AI, it is not same as AI. An ambient intelligence system has to depend on the innovations in other fields such as "sensor networks" to assist in collecting data, "robotics" to construct actuators and helpful robots, and "Human Computer Interaction" to construct natural interfaces.

II. Applications ofAmbient Intelligent systems

A. *Security and Surveillance Systems*

The most useful and important application of this technology is in the security and surveillance systems.

The Unattended Autonomous Surveillance (UAS) system is an example of ambient intelligence technology installed in homes. The UAS-system provides functionalities such as monitoring movement and detecting wandering of people and preventing it, sound and voice response, detection of fire.

B. *Mobility and Driving*

Using the Ambient Intelligent System, you can convert smart phone sensor data into real-life and real-time behavioral profiles and also into rich insights into mobility, commute, and driving patterns. By tracking multimodal transport activities, personalized heat maps and mobility profiles are created to offer a contextual view into transport trips and patterns, places visited and usual paths. Additionally,high-quality service and safety control, superior maintenance and insurance solutions, and personalized driver coaching and assistance are provided by using the same motion sensor data, and detailed and multi-layered driver behavior profiles and scores.

This technology is useful in fleet management, driver tracking, coaching , predictive car maintenance, administration of mobility and multimodal trips, and budgeting of multimodal trips.

C. *Ageing-in-Place Support*

The ambient intelligence technologies help the elderly in preventing incidents of skidding and falling. Anti-skid flooring and connected systems to report falls to the hospital and ambulance services immediately are some examples of the Ageing-in-Place support system.

For example, high chances of the elderly falling on the stairs can be detected and alerts can be sent immediately. This system learns the walking patterns of the elderly people to analyze and detect the events of falls.

D. *Automatic Placement of Orderby the Refrigerator*

The ambient intelligence technologies help your refrigerator to place orders intelligently when it detects only one can of milk or packet of bread, cheese, or jam is left in it. By detecting the regular patterns, the order is automatically placed in your refrigerator.

E. *Helpful Tips on Weather, Traffic Jams and Alternative Routeson the Interactive Screen of the Mirror*

An interactive screen on the corner of your mirror guides you every day while you get ready about the best time to avoid traffic jams, best alternative driving routes, weather, your daily appointments, personal to do list.

F. *Voice Controlled and Hands-Free Operations of Smart Devices*

You can control your smart devices with your voice. It allows you to order meals, book an Uber taxi, play music, know about weather, news, sports, and control a range of other smart devices with one smart device such as Echo Dot. Smart Jacket to prevent accidents of Cyclists.

The smart jacket shows an arrow on the back of the jacket whenever the cyclist is about to turn left or right and road safety signs that allow people traveling around the cyclists to move with caution.

Vodafone collaborated with Technical University Delft and the Dutch Cyclist Association to make the innovative jacket, which connects with the smart phone of the cyclist. Cyclists draw their cycling route on an app and then insert their smart phone into a special pocket .The moment the smart phone is inserted in the pocket, it uploads the route and communicates with an integrated Raspberry Pi device connected to 300 integrated LEDs. These lights on the sleeves of the jacket guide the cyclist with the best cycling route and the arrows on the back of the jacket alert drivers around him to where the cyclist is going to turn.

Vodafone has manufactured this Smart Jacket and it also helps in stopping cyclists from using their mobile phones to read the route map while riding.

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