

# Study of the Concepts and Challenges of Ambient Intelligence (AmI)

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## Abstract

Ambient intelligence is a vision on the future of consumer electronics, telecommunications and computing that was originally developed in the late 1990s for the time frame 2010–2020. The Ambient Intelligence paradigm builds upon pervasive computing, ubiquitous computing, profiling practices, context awareness, and human-centric computer interaction design and is characterized by systems and technologies. In computing, Ambient Intelligence (**AmI**) refers to electronic environments that are sensitive and responsive to the presence of people. In an ambient intelligence world, devices work in concert to support people in carrying out their everyday life activities, tasks and rituals in easy, natural way using information and intelligence that is hidden in the network connecting these devices. As these devices grow smaller, more connected and more integrated into our environment, the technology disappears into our surroundings until only the user interface remains perceivable by users. Ambient intelligence is closely related to the long term vision of an intelligent service system in which technologies are able to automate a platform embedding the required devices for powering context aware, personalized, adaptive and anticipatory services.

**Keywords:** *Ambient Intelligence, Ubiquitous Computing, Artificial Intelligence, Sensors, Decision Making, Context Awareness, Privacy.*

## Introduction

Ambient Intelligence (AmI) is a new paradigm in Information Technology that has potential for great impact in the future. The vision of AmI is that the people will be surrounded by intelligent objects that can sense the context and respond according to the desire of the people. AmI is a multidisciplinary topic, since it combines the features of many of the areas in Computer Science. In the last five years, we have seen significant advances in three promising technology areas: virtual environments, in which 3D displays and interaction devices immerse the user in a synthesized world, mobile communication and sensors, in which increasingly small and inexpensive terminals and wireless networking users to roam the real world without being limited to stationary machines. The merging of these areas allows the emergence of a new vision: the **Ambient Intelligence** (AmI).

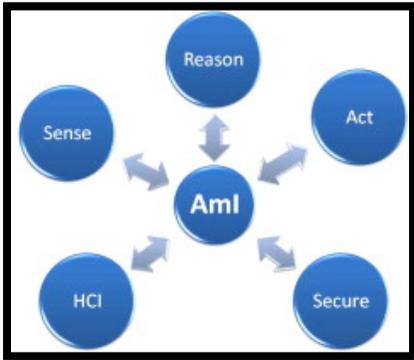


Figure 1 AmI Characteristics

## Review of Real Life AmI Projects

### Interfacing Physical and Digital Worlds

AIR Lab is designed in the form of a smart room providing natural settings of a living environment while offering an ambient interface to its user through pervasive sensing, processing, and communication.

The network of sensors and a user interface fuse real-time inference and contextual data to enable adaptive services through interactive learning. This fusion connects the user's physical world with the digital world, enabling context-aware personalized services and placing the user at the center of human-centric computing.



Figure 2 Networks of Sensors

AmI is comprised of three main components: ubiquitous computing, ubiquitous communication, and user adaptive interfaces.

### Scenario – I: Home Environment

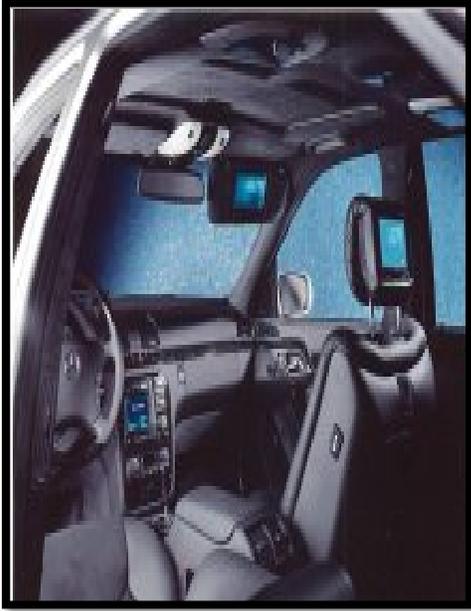
- Large scale network of computing devices
- Personalize the living space of humans
- Ease access to Information and Resources
- On-demand



Figure 3 AmI Home Environments

### Scenario – II: Automotive Intelligence

- Telemetric (Mercedes-Benz)
- Online concierge services
- Tele Diagnosis
- Safety – auto braking for active collision avoidance
- Route Planning



**Figure 4 AmI Automotive Intelligence**

### **Vision of Ambient Intelligence**

AmI is the vision of an environment

- filled with smart and communicating devices,
- which are naturally embedded in the environment and in common objects,
- While their presence is kept as seamless as possible.

### **Summary of Findings**

We are gradually making a transition to a new era where computers become truly intertwined with our daily lives. Up to not so long ago, we were able to know clearly where computers were and in which way they affected our lives. This has been gradually blurred and now computing devices of various types are all around us, embedded in different objects we interact with and in that way they influence our lives. There are indications that this trend is irreversible and that computing and society will now interact with each other in far richer ways than before, to the point that computing will become transparent to humans and still intrinsically involved in our daily living. This paper provides a brief overview of the evolution of these fields, describes some of the current developments,

and points at some of the immediate challenges that researchers in these area face.

### **Challenges**

A major challenge about ambient intelligence is to build a bridge between the contradictory requirements of personalization and privacy.

- Interoperability: Networks architecture and integration
- Saturation: increased volume of information and users
- Security: solutions with quantum cryptography?

### **The Future**

- Attractive future blends:
  - Computing
  - Communications
  - Consumer electronics
- Technological and Ethical challenges need to be overcome
- Social acceptance is critical

### **Conclusions**

The last section may have emphasized what the area is still missing and the hardship of working in a field which has ambitious practical aims. However, it is not all that gloomy. The same reasons used to say there is no guarantee of success can be used to argue there is no proof that the aims are unachievable. There are already good success stories and developments are gradually starting to appear in the form of smart homes, smart cars, smart classrooms, smart offices, etc. Patience and sustained work will be needed to extend the technical frontiers of this area bit by bit. To what extent these technologies will be taken by society it is to be discovered, meanwhile the potential benefits are such that it is worth trying. Researchers and developers should remember at all times that users are at the centre and that technology should be built for them.

## References

1. E. Aarts and J. Encarnacao. True Visions: & Emergence of Ambient Intelligence. Springer, 2006.
2. E. Aarts and L. Appelo. Ambient intelligence: thuisomgevingen van de toekomst. IT Monitor
3. [http://www.google.co.in/search?q=ambient+intelligence&hl=en&tbm=isch&tbo=u&source=u&ved=0CDcQsAbiw=1366&bih=638#imrc=ff86\\_XB](http://www.google.co.in/search?q=ambient+intelligence&hl=en&tbm=isch&tbo=u&source=u&ved=0CDcQsAbiw=1366&bih=638#imrc=ff86_XB)
4. <http://www.sciencedirect.com/science/article/pii/S157411>
5. Toni Janevski, “5G Mobile Phone Concept,” Consumer Communications and Networking Conference, 2009 6th IEEE [1-4244- 2308-2].