Exam on DA274A Internet of Things and People
2017-01-09, 14:15-18:15

Tools

Pen and paper

Instructions

Address at most one assignment per paper sheet, write only on one of the sides, and mark each sheet with your initials. Try too keep your answers as short as you can (usually one sentence is enough). Max number of points on this exam is 44 points. For the grade "Väl Godkänd" you need to acquire at least 33 points (75%) and for the grade "Godkänd" you need to arrive to at least 22 points (50%).

Good luck! /Thomas, Shahram, Ulrik, Radu, Andreas

Question 1 (2 points)

Mark Weiser worked at an industrial research lab when he wrote the influential research article "The Computer for the 21st Century" in Scientific American and when he first started to use the term "Ubiquitous Computing".

a) What was the name of that research lab? (1p)

b) Approximately in what year was the article published? (1p)

Question 2 (8 points)

As part of the design process, developers of interactive systems (including Ubicomp systems) tend to iteratively go into different phases where the focus of the activities have specific target outcomes. Benyon (2010) pictures these four kinds of design activities as shown in the figure below:
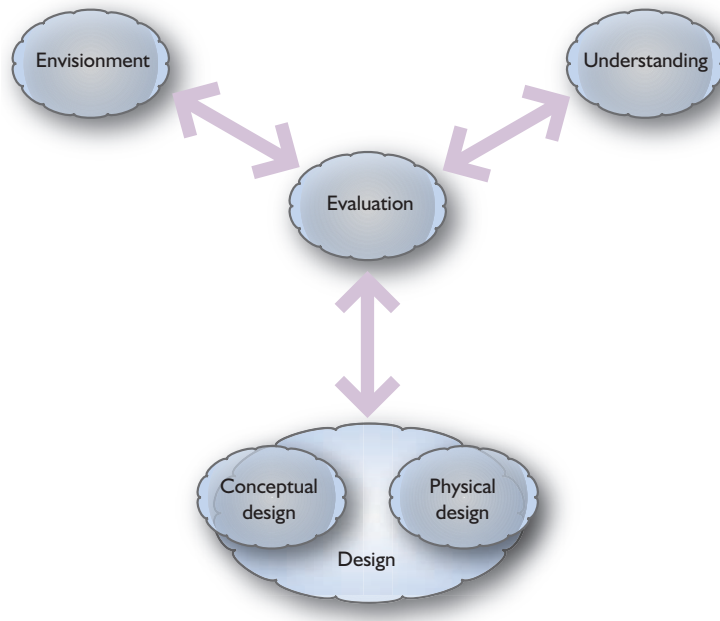
(Benyon, 2010)

a) For each of the four types of activities, explain with 1-3 sentences the focus of the activity and what the activity aims at determining. (1 + 1 + 1 + 1p)

b) For each of the four types of activities, describe with 1 sentence an effort you made in your group project that corresponds to the specific activity type. (1 + 1 + 1 + 1p)

Question 3 (1 point)

From the perspective of system architecture design, mobile and pervasive computer systems are very different from more classical stationary computer systems: "changes are common rather than exceptional". What is the English term used to describe this property of dynamism shared by all mobile and pervasive systems? (1p)

Question 4 (3 points)

When components in a Ubicomp/IoT system collaborate, e.g. in a smart space, they do this through "association" and "interoperation". Explain the two concepts and the relationship between the two! (3p)

Question 5 (2 points)

Explain with 1-3 sentences what (the difference between) implicit and explicit *input* is in the context of human-computer interaction? (2p)

Question 6 (3 points)

In context-aware systems, knowledge about *who* is doing *what*, and *where* is often something the systems try to figure out in order to reduce the need for human agents to provide explicit input. For each of these three context parameters, using 1-2 sentences, give an example of a common technology and/or method for determining the specific context parameter. (3p)

Question 7 (5 points)

Pair the following location tracking *technologies* with the most suitable location tracking *approach (5p)*:

Technologies	Approaches
WiFi routers / clients	proximity
QR codes / cameras	dead reckoning
GPS satellites / receivers	hyperbolic lateration (time difference of arrival)
accelerometers	angulation
RFID tags/readers	fingerprinting

Question 8 (2 points)

The performance of location tracking systems is sometimes measured in terms of *precision* and *accuracy*. What do these two metrics actually measure? (2p)

Question 9 (4 points)

The three most common kind of tags used in Ubicomp/IoT systems are visual tags, radio-based tags, and infrared tags. a) give an example of radio-based tag standard and common application area for that tag standard. b) give an example of a visual tag standard and common application area for that tag standard. (2 + 2p)

Question 10 (2 points)

What is the difference between supervised and unsupervised learning? (2p)

Question 11 (3 points)

How did you preprocess the data in your project (accelerometer & gyro-based gesture recognition solution)? Explain briefly the techniques that you used in each step of preprocessing and motivate why you chose these techniques. (3p)

Question 12 (1 point)

What is the meaning of the term "security"? (1p)

Question 13 (5 points)

An IoT system is sometimes described as consisting of five layers with different purposes. The naming of the layers may be different depending on author, but the main responsibility is similar. From top to bottom the layers are:

• Business Layer

• Application layer

• Service management or middleware layer

• Object abstraction, transmission or network layer

• Perception, device or objects layer

Describe the purpose of each layer and give at least one example of a typical service or main component for each layer. (5p)

Question 14 (3 points)

What are the advantages and disadvantages of using Cloud-based vs. Decentralised approach for implementing IoT applications. Illustrate your points with examples. (3p)