

Sistemas de Computação Móvel e Ubíqua

2017/2018

First test: 21/04/2018 Duration: 1:15h

Closed book

1. One technique to measure distances is the time-of-flight (ToF). Describe the main challenges (problems) that this technique has to deal with.
2. An IR system can be used to determine the position of a user inside a building.
 - a. Explain how it can be used and possible problems.
 - b. Suggest possible solution(s) to minimize (or solve) the problems.
3. A sensor is a device that detects and responds to some type of input from the physical environment.
 - a. What is the linearity of a sensor?
 - b. Which factors can influence it?
 - c. How can it influence an application behavior? Suggest possible ways to deal with it.
4. A wireless sensor network is an organized collection of nodes, describe and explain the main components of a typical architecture of a node.
5. Briefly explain how Bluetooth technology handles interference in order to reduce its impact.
6. A very simplified definition of Internet of Things: “IoT is the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data, even without human intervention”.
Given this definition, what do you think are the main challenges faced by an IoT system and the key characteristics it needs to support?
7. Suppose that you have to develop a system to manage the environment conditions of several offices according to its occupant’s predefined preferences. The system is able to detect and control the temperature and lighting system of each room. The system should also detect when a registered user enters the office in order to adapt the room conditions to that particular user predefined preferences. Each user can register and define his temperature and light preferences from a mobile device. When more than one registered user are in a room the system should follow the preferences of the user that first entered the room, if this user leaves the room the remaining users will be notified to choose one of the possible configurations.
Present an outline of your system, describing its key hardware and architecture elements. Clearly define the sensors/actuators used, their control system and the communication infrastructure; also present a short but clear explanation of the software infrastructure of your solution and the interactions (communication) between the system's elements. Justify all your options.