Diploma Programme
Programme du diplôme
Programa del Diploma

Computer science
Higher level
Paper 3

29 October 2024

Zone A morning | **Zone B** morning | **Zone C** morning

1 hour

Instructions to candidates

- Do not turn over this examination paper until instructed to do so.
- A clean copy of the **computer science case study** is required for this examination paper.
- Read the case study carefully.
- Answer all questions.
- The maximum mark for this examination paper is **[30 marks]**.

8824 – 6906

2 pages

Answer **all** questions.

1. (a) Define the term *visual simultaneous localization and mapping* (*vSLAM*). [2]

(b) Describe why a GPS signal may be denied or degraded in a rescue environment. [2]

2. (a) Sensor fusion can be used to increase the rescue robot's ability to create an accurate map under difficult circumstances.

Describe how sensor fusion can help a rescue robot in a burning, smoke-filled building. [4]

(b) When tracking fails, vSLAM executes a module for relocalization (line 81).

Explain the process of relocalization. [4]

3. Rescue operations are dangerous not only to those needing help, but also to the rescuers. However, survivors may be uncomfortable with robots and would prefer to be helped by a compassionate human being.

Evaluate whether rescue robots should be sent into rescue situations to save survivors. [6]

4. Rescue robots rely on the success of several technologies working together to correctly access a disaster zone, create a map, localize themselves, recognize objects and survivors, and then carry out a rescue.

The perfect rescue robot would have the available technology and equipment, but there may be practical reasons why the robot does not have all of these.

Justify which technologies and features a rescue robot should have and which might be unnecessary or impractical. [12]