

Software Engineering

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IT 382
Software Engineering

Lecture 2



LECTURE OUTLINE

- ◉ **Software engineering ethics**
- ◉ **Case studies**

SOFTWARE ENGINEERING ETHICS

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- Software engineering involves wider responsibilities than simply the application of technical skills.
- Software engineers must behave in an honest and ethically responsible way if they are to be respected as professionals.
- Ethical behavior is more than simply upholding the law but involves following a set of principles that are morally correct.

ISSUES OF PROFESSIONAL RESPONSIBILITY

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- **Confidentiality**

- Engineers should normally **respect the confidentiality of their employers** or clients irrespective of whether or not a formal confidentiality agreement has been signed.

- **Competence**

- **Engineers should not misrepresent their level of competence.** They should not knowingly accept work that outwits their competence.

ISSUES OF PROFESSIONAL RESPONSIBILITY

- **Intellectual property rights**

- Engineers should be aware of local laws governing the use of intellectual property such as **patents, copyright**, etc. They should be careful to ensure that the intellectual property of employers and clients is protected.

- **Computer misuse**

- Software engineers should not use their technical skills to misuse other people's computers. Computer misuse ranges from relatively trivial (game playing on an employer's machine, say) to extremely serious (dissemination of viruses).

ACM/IEEE CODE OF ETHICS

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- The professional societies in the US have cooperated to produce a **code of ethical practice**.
- Members of these organisations sign up to the code of practice when they join.
- The Code contains **eight Principles** related to the behaviour of and decisions made by professional software engineers, including practitioners, educators, managers, supervisors and policy makers, as well as trainees and students of the profession.

RATIONALE FOR THE CODE OF ETHICS

- *Software engineers are those who contribute by direct participation or by teaching, to the analysis, specification, design, development, certification, maintenance and testing of software systems.*
- *Because of their roles in developing software systems, software engineers have significant opportunities to do good or cause harm, to enable others to do good or cause harm, or to influence others to do good or cause harm.*
- *To ensure, as much as possible, that their efforts will be used for good, software engineers must commit themselves to making software engineering a beneficial and respected profession.*

SOFTWARE ENGINEERING CODE OF ETHICS

THE ACM/IEEE CODE OF ETHICS

- Software engineers shall commit themselves to making the analysis, specification, design, development, testing and maintenance of software a beneficial and respected profession.
- In accordance with their commitment to the health, safety and welfare of the public, software engineers shall adhere to the **following Eight Principles.**

PUBLIC

Software engineers shall act consistently with the public interest.

يتصرف مهندسو البرمجيات بما يتفق مع المصلحة العامة

CLIENT AND EMPLOYER

Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.

يجب على مهندسي البرمجيات أن يتصرفوا بطريقة تصب في مصلحة العميل وصاحب العمل بما يتفق مع المصلحة العامة

PRODUCT

Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.

يجب على مهندسي البرمجيات التأكد من أن منتجاتهم والتعديلات ذات الصلة تفي بأعلى المعايير المهنية الممكنة

JUDGMENT

Software engineers shall maintain integrity and independence in their professional judgment.

يجب على مهندسي البرمجيات الحفاظ على النزاهة والاستقلالية في حكمهم المهني

MANAGEMENT

Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.

يجب أن يشترك مديرو وقادة هندسة البرمجيات في نهج أخلاقي لإدارة تطوير البرمجيات وصيانتها وتعزيزه

PROFESSION

Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.

يجب على مهندسي البرمجيات تعزيز نزاهة وسمعة المهنة بما يتفق مع المصلحة العامة

COLLEAGUES

Software engineers shall be fair to and supportive of their colleagues.

يجب أن يكون مهندسو البرمجيات عادلين وداعمين لزملائهم

SELF

Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.

يجب أن يشارك مهندسو البرمجيات في التعلم مدى الحياة فيما يتعلق بممارسة مهنتهم ويجب أن يعززوا النهج الأخلاقي لممارسة المهنة

CASE STUDIES

CASE STUDIES

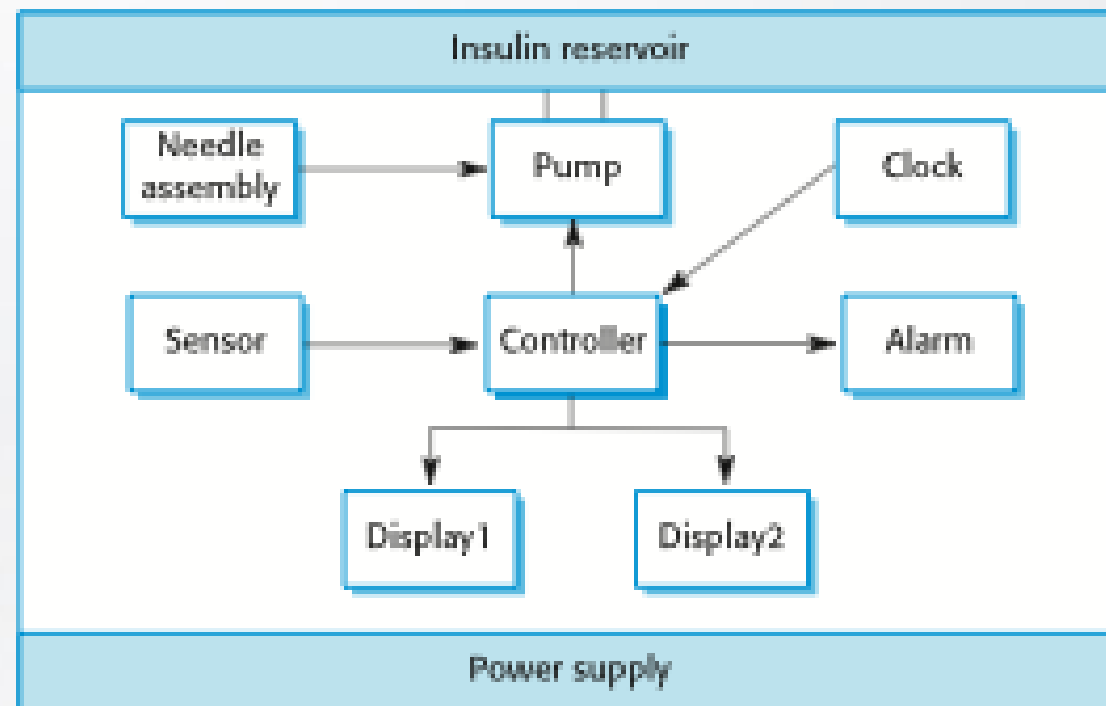
- **A personal insulin pump**
 - An embedded system in an insulin pump used by diabetics to maintain blood glucose control.
- **A mental health care patient management system**
 - A system used to maintain records of people receiving care for mental health problems.

INSULIN PUMP CONTROL SYSTEM

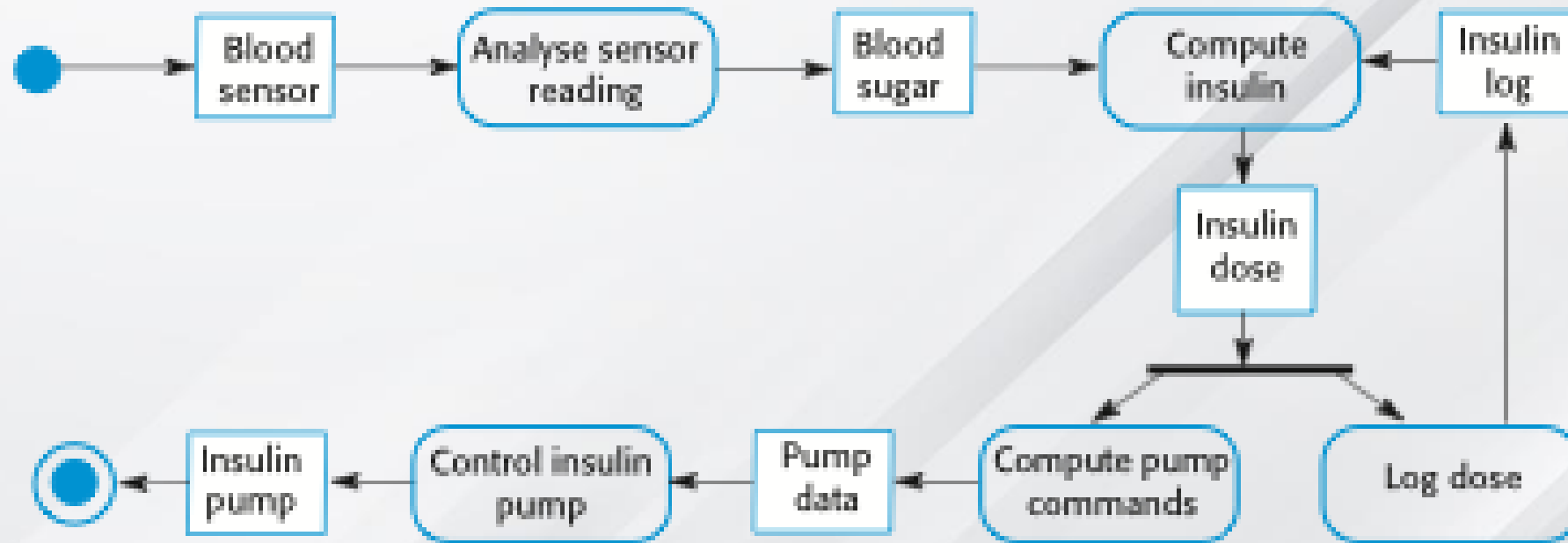
INSULIN PUMP CONTROL SYSTEM

- Collects data from a blood sugar sensor and calculates the amount of insulin required to be injected.
- Calculation is based on the rate of change of blood sugar levels.
- Sends signals to a micro-pump to deliver the correct dose of insulin.
- Safety-critical system, as low blood sugar can lead to brain malfunctioning, coma and death; high-blood sugar levels have long-term consequences such as eye and kidney damage.

INSULIN PUMP HARDWARE ARCHITECTURE



ACTIVITY MODEL OF THE INSULIN PUMP



ESSENTIAL HIGH-LEVEL REQUIREMENTS

- The system shall be **available** to deliver insulin when required.
- The system shall **perform reliably** and deliver the correct amount of insulin to counteract the current level of blood sugar.
- The system must therefore be designed and implemented to ensure that the system always meets these requirements.

A PATIENT INFORMATION SYSTEM FOR MENTAL HEALTH CARE

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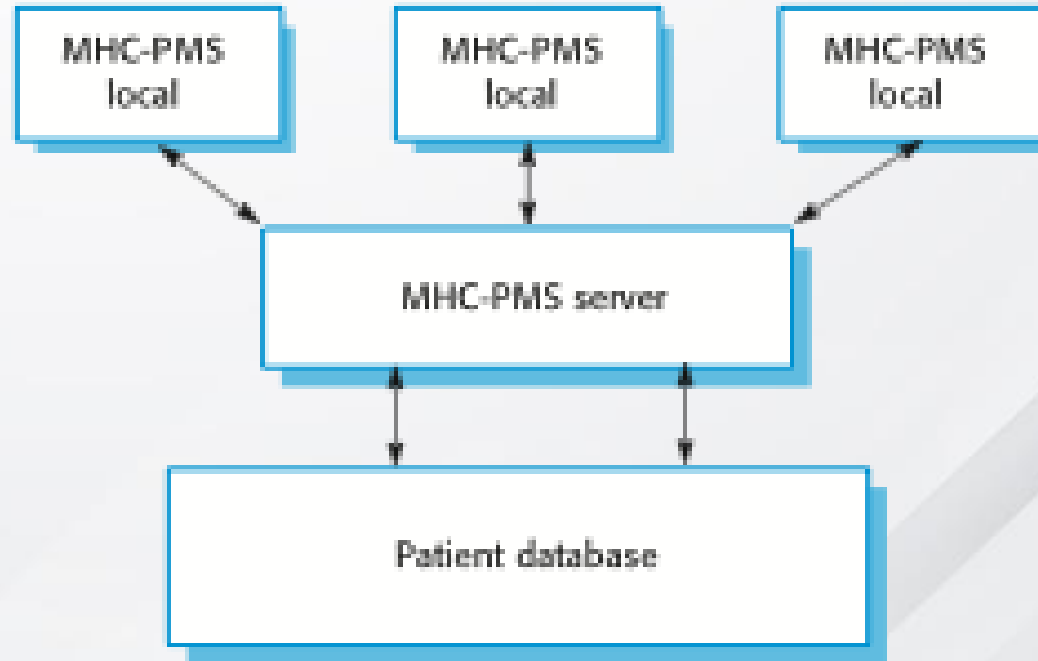
- A medical information system that maintains information about patients suffering from mental health problems and the treatments that they have received.
- Most mental health patients do not require dedicated hospital treatment but need to attend specialist clinics regularly where they can meet a doctor who has detailed knowledge of their problems.
- To make it easier for patients to attend, these clinics are not just run in hospitals. They may also be held in local medical practices or community centres.

- The MHC-PMS (Mental Health Care-Patient Management System) is an information system that is **intended for use in clinics**.
- It makes use of a **centralized database** of patient information but has also been designed to run on a PC, so that it may be accessed and used from sites that do not have secure network connectivity.
- When the local systems have secure network access, they use patient information in the database but **they can download and use local copies of patient records when they are disconnected**.

MHC-PMS GOALS

- To **generate management information** that allows health service managers to assess performance against local and government targets.
- To provide medical staff with **timely information** to support the treatment of patients.

THE ORGANIZATION OF THE MHC-PMS



MHC-PMS KEY FEATURES

- **Individual care management**

- Clinicians can **create** records for patients, **edit** the information in the system, **view** patient history, etc. The system supports data summaries so that doctors can quickly learn about the **key problems** and **treatments** that have been prescribed.

- **Patient monitoring**

- The system **monitors the records** of patients that are involved in treatment and **issues warnings** if possible problems are detected.

- **Administrative reporting**

- The system generates **monthly management reports** showing the number of **patients treated** at each clinic, the number of patients who have **entered and left** the care system, the drugs prescribed and their costs, etc.

MHC-PMS CONCERNS

- **Privacy**

- It is essential that patient information is confidential and is never disclosed to anyone apart from authorised medical staff and the patient themselves.

- **Safety**

- Some mental illnesses cause patients to become suicidal or a danger to other people. Wherever possible, the system should warn medical staff about potentially suicidal or dangerous patients.
- The system must be available when needed otherwise safety may be compromised and it may be impossible to prescribe the correct medication to patients.

SUMMARY

- Software engineers have responsibilities to the engineering profession and society. They should not simply be concerned with technical issues.
- Professional societies publish codes of conduct which set out the standards of behaviour expected of their members.
- Two case studies:
 - An embedded insulin pump control system
 - A system for mental health care patient management



Thank You

