CMPT 276 Class 01: Introduction To The Introduction To Software Engineering

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Fall 2020

Today's Topics

1. No, Really, What's Software Engineering?
2. Getting you into the right mindset for this course by introducing:
   1. **Software process activities**
   2. Essential **attributes** of good software
   3. Different **types** of applications
   4. Both **common** and **different needs** of different software.

Software Engineering Defined (Again)

- **Software Engineering**: The theories, methods, and tools for professional software development.
- It is a **discipline** concerned with all aspects of software production, from early specification to maintaining systems while in use.
- Good practices to solve problems within business and financial restraints.

Workplace Terminology

- **Programmer**: Anyone who writes code.
- **Engineer**: Technical professionals, often licensed.
- **Software Developer**: Applies engineering principles to the production of reliable, maintainable, and consistent software.

Why Is Software Engineering Important?

- Everything runs on software now.

- Imagine the pandemic without the ability to work from home.

(Note: some people DO have to live like that)

Image credits: https://en.wikipedia.org/wiki/Automated_teller_machine
https://en.wikipedia.org/wiki/Smartphone
https://www.forbes.com/sites/curtissilver/2019/11/26/finally-a-touchscreen-toaster-exists-in-the-revolution-cooking-r180/#53b316f37f37

Objectives Of Software Engineering

- Producing **reliable** systems **quickly** and **affordably**.

- The cost of engineering principles **scale** better than the individual craftsman approach.

- An ounce of prevention is worth a pound of cure: **fixing post-release** systems is expensive!

Software Process Activities

1. **Specification**

   Customer and developers define software features and constraints on its operation.

2. **Development**

   Design and program the software.

3. **Validation**

   Ensure software is what customer requires.

4. **Evolution**

   Modify software to reflect changing customer and market requirements.

Essential Attributes of Good Software

- **Maintainability**
  - Design software with evolution in mind.
- **Dependability & Security**
  - Must be reliable, secure, and safe. Must not cause physical or economic damage on failure.
  - Malicious users unable to access/damage system.
- **Efficiency**
  - Efficient use of resources: processing time, memory.
- **Acceptability**
  - Software must be acceptable its users: understandable, usable, and compatible with other systems.

Class Discussion: Comparing Software Development Challenges

Animal Crossing

- Maintainability
- Dependability
- Efficiency
- Acceptability

A Self-Driving Car

- Maintainability
- Dependability
- Efficiency
- Acceptability

Image credits: https://www.wired.com/story/news-rules-clear-way-self-driving-cars/
https://en.wikipedia.org/wiki/Tom_Nook

Types Of Applications

1. **Stand-alone Applications**

   -Include all necessary functionality, does not need to be connected to a network.

2. **Embedded Applications**

   -Software control systems for hardware devices. There are more embedded systems than any other type of system

3. **Entertainment Applications**

   -Games!

More Types Of Applications

4. **Batch Processing**

   -Process data in large batches (Ex: payroll; monthly billing by a phone company)

5. **Modelling and Simulation**

   -For scientists and engineers to model complex physical process or simulations (Ex: car crashes, nuclear reactions, weather prediction)

6. **Data Collection**

   -Collect sensor data to send to other systems for processing.

7. **Systems of Systems**

   -Combine some other software systems. Ex: Car.

Even More Types Of Applications

8. **Web Software**

   -Reuses many system components

   -User interfaces limited by the web browser.

9. **Software as a Service**

   -Applications run remotely on the cloud. Users don't buy software, they pay according to use (Ex: Google docs, Amazon Web Services, etc)

   -Cloud ‘as-a-service’ types:

   a. Software as a Service (SaaS)
   b. Platform as a Service (PaaS)
   c. Infrastructure as a Service (IaaS)

General Software Issues

- **Diverse Types of Systems**
  - Distributed systems operate across networks, different types of computers, and many mobile devices.
- **Changing Environment**
  - Software has to keep up with rapidly changing business and society.
  - Must change existing software and rapidly develop new software.
- **Security and Trust**
  - Software is intertwined with all aspects of our lives, it’s essential we can trust it.

Diversity Of Needs

- **Common Needs**: All software projects should be professionally managed and developed.
- **Different Needs**: Different types of systems require different techniques
  - Games can be iterated on.
  - Life-critical systems need a complete specification first time!
- Select software engineering methods and tools by:
  - The **type** of application being developed.
  - The **requirements** of the customer.
  - The **background** of the development team.

Recap – Now You're Introduced To Software Engineering!

- **Software Engineering Defined:** a discipline concerned with all aspects of software production.
- **Essential Software Attributes:** maintainability, dependability & security, efficiency, and acceptability.
- **Software Process Activities:** specification, development, validation and evolution.
- **Fundamentals of software engineering** are applicable to all types of system development.
- **Different types of systems** require different software engineering tools and techniques.

Next week – Version Control!