What is software engineering? Why do we need it?

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CMSC 355 - Software Engineering: Spec and Design

Fall 2015

School of Engineering | Computer Science

Welcome to CMSC 355

- My name: Kosta (Kostadin) Damevski
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- My office hours: Mondays 1:00pm - 3:00pm

Course Organization

- Online Presence
  - Course schedule and slides
    - http://damevski.github.io/cmsc355
  - Assignments, assignment submission, grades, etc.
    - on Blackboard
  - Discussions
    - on Piazza

Grading is Simple

- 50% - Team Project
- 30% - Final Exam
- 20% - Midterm

Team Project

- A semester long, agile, development project intended to illustrate concepts from class
  - Project grade is about many other aspects other than writing code
  - There will be project presentations by each team at the end of the semester
- Theme: Android Apps (Java)
- Team size: 4-5 students
- More on this very soon…

Grading the Team Project

- Individual effort
  - Some thresholds of lines of code written and issues completed ensure that things are getting done
- Group effort
  - Anonymous ratings of fellow group members at the end of each iteration
    - Can reduce iteration grade but not improve it
    - First iteration will be a warning
- Grades at the end of each iteration
- Grades on the completed project (includes presentation)

Course Plan

- Class will be for lectures, mostly
  - Cover a variety of software engineering topics
    - Some of them will be part of the team project
    - All of them will be (fair game) for the exams
- I will likely spend a few lectures on Android
  - Things that everyone would benefit from
  - But, there is a lot you will need to learn on your own

Piazza

- For Q and A, and for team forming
  - Teaching staff and fellow students answer questions
  - If you are active on Piazza, there will be bonus points that can help you if you have a borderline grade
- Before e-mailing a question to the teaching staff, make sure it hasn't been answered on Piazza
  - Consider asking the question on Piazza
    - unless it's about grading or other personal stuff

Questions

- Does the course organization make sense?

Why do we study software engineering?

- A computer is a programmable device
    - So programming it is a fundamental activity
- We ask a lot from our software
    - Complexity
    - Heterogeneous tasks
        - inside a car vs. inside a server
- Managing that complexity requires more than just programming skill

What should you expect to learn in this course?

- Methodologies
- Techniques
- Tools
- …to build high-quality software that fits budget

Software Development Effort

Size	Example
10^2 LOC	Class Exercise
10^3 LOC	Small Project
10^4 LOC	Term Project
10^5 LOC	Business Application
10^6 LOC	Word Processor
10^7 LOC	Operating System

Programming Effort

Software Engineering Effort

Software Failure Du Jour

- "FAA Software Upgrade Fails, Triggering Travel Nightmare" — *www.wsj.com (retrieved 8/17/2015)*
    - "[…] problems at a Federal Aviation Administration air-traffic-control center in Virginia led to cancellations of 476 flights."
    - "The FAA said late Sunday that its difficulties on the previous day likely were linked to a recent software upgrade at its high-altitude radar facility in Leesburg, Va. The FAA said in a statement that it has disabled the features added in that upgrade as it investigates further, and added that the weekend's troubles weren't related to its long-delayed and criticized En Route Automation Modernization system, or ERAM, for tracking flights at high altitudes."

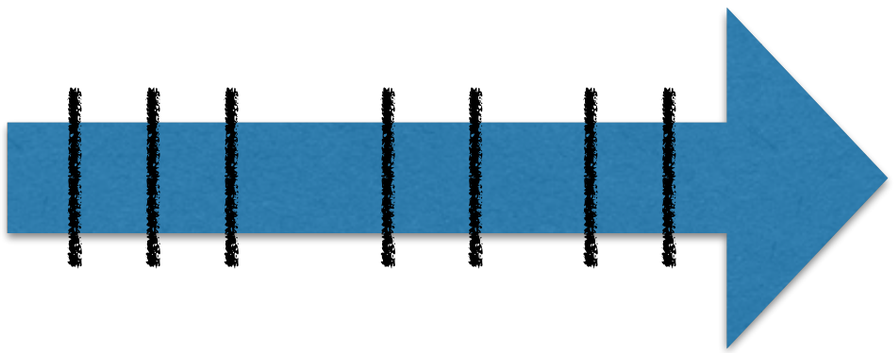
Engineering SW is different from engineering HW

- ***Question:*** Why so many SW disasters and no HW disasters?
  - Ariane 5 rocket explosion
  - Therac-25 lethal radiation overdose
  - Mars Climate Orbiter disintegration
  - FBI Virtual Case File project abandonment
  - HealthCare.gov
- ***One possible answer:*** Nature of the two media and subsequent cultures that developed

Engineering SW is different from HW

- Cost of field update
  - On hardware it's very large
    - Hardware designs have to be finished before they are shipped
      - Bugs => return hardware => lost $$$
  - On software it's very small
    - Expect software to get better over time
    - Bugs => wait for an upgrade
- HW decays slowly, while software can be long lasting

Software Development



The SW engineering task is split into multiple steps according to a ***software development process***

Software Development Processes

- Waterfall vs. Spiral vs. Agile

Summary

- We need software engineering to manage the complexity of designing software
    - A set of scientific principles and best practices
        - We will discuss these in the lectures
        - We will experience some of them in our team project
- Your task now
    - Log in to Piazza and Blackboard
    - Assignment 1 is on Blackboard

Assignment 1 in Blackboard

- Due Sunday @ midnight
- Individual project ideas
    - I'll aggregate them and post them as a first step in creating groups
    - Group formation via Piazza, and due at the end of next week
- Consider openmhealth.org as a possibility
    - Platform for storing, analyzing and visualizing health data

Questions

- Any questions so far?