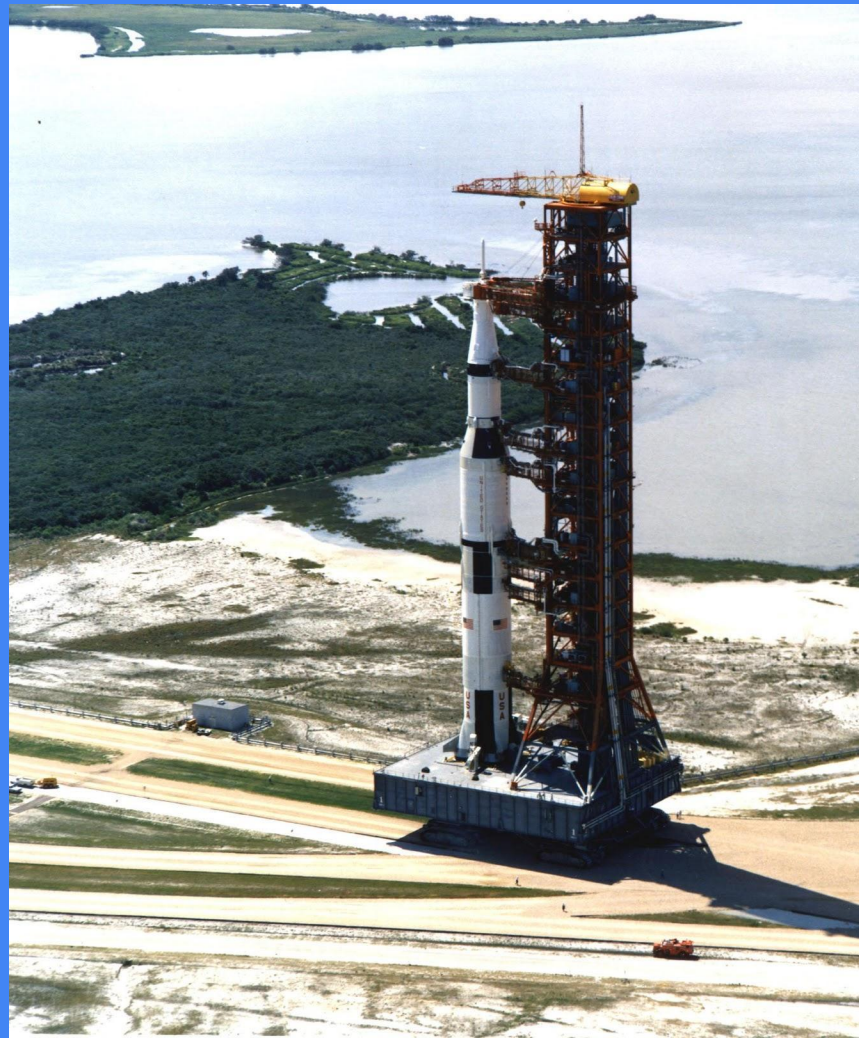


SE101

Ideas Clinic

Prof Derek Rayside
Future SE Director (January 2020)



Engineer an AI for a space ship!

What is Software Engineering?

What is Software Engineering?

“The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software”

—*IEEE Standard Glossary of
Software Engineering Terminology*

What is Software Engineering?

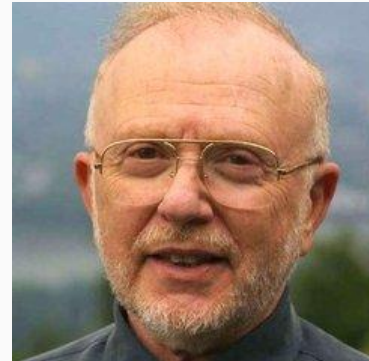
1. any act of planning, designing, composing, evaluating, advising, reporting, directing or supervising (or the managing of any such act);
2. that requires the application of engineering principles; and
3. concerns the safeguarding of life, health, property, economic interests, the public welfare or the environment.

—*Professional Engineers Act Ontario (section 1)*

What is Software Engineering?

“Multi-*person* development of multi-*version* programs”

—*David L. Parnas & Brian Randell*



CS137 is Computer Science / Programming

- *Single-person* development of *single-version* programs
- Concepts:
 - Data structures
 - Algorithms
 - Modularity mechanisms (e.g., procedures, classes, etc)
 - Pointers
 - Space + time complexity analysis
- Essential knowledge + skills!

SE101 is Software Engineering

1. Professional Responsibility

- Duty to public welfare is paramount
- Engineers build and safeguard the infrastructure of society

2. Teamwork

- **Multi-Person** Development

3. Configuration Management

- **Multi-Version** Software

Engineering is Teamwork

Did 1 person engineer this?

The Quebec Bridge.
Iron Rings are from here.

First attempt collapsed, in part, due to poor teamwork.

Still the longest cantilever span bridge in the world (almost 1km).



Autonomous Vehicles

Tens of thousands of
Engineering Jobs.

Can't build by yourself!

PS: Watonomous.ca



Did Linus write Linux?

He started it.

15,600 contributors now.
Linus authored ~ 2%.

Linux is just a kernel.
Runs on the GNU system.

*PS: He took a month off
last year to learn better
team interpersonal skills.*



Engineering is Teamwork

What is Teamwork?

Teamwork:

Interpersonal Skills

- Listening
- Respect
- Communication
- Conflict Resolution
- **Be nice!**



How will we teach you *Interpersonal* skills?

Experience

New pairs each day.

New challenges each day.

Reflection

What did you learn?

What went well?

What could be improved?

Teamwork: *Technical* Skills

Today!

- Pair Programming
- Git (version control)

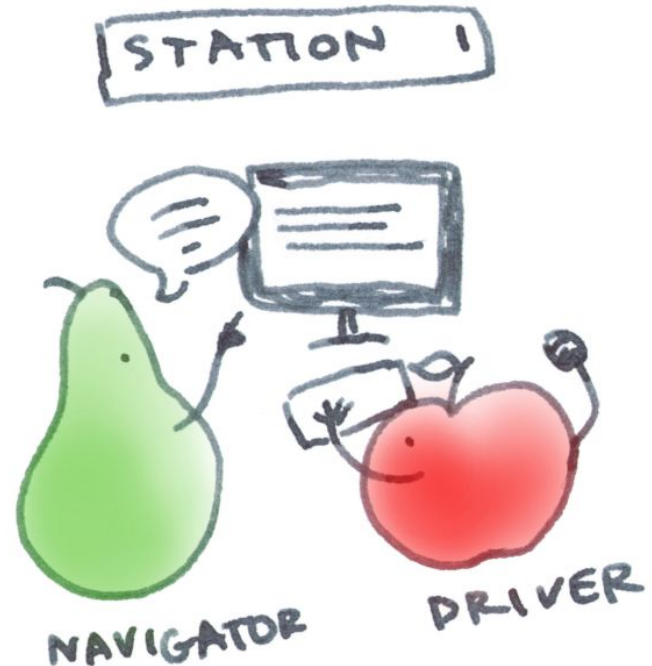
Thursday

- Division of Labour
i.e., Who does what?

Today!

Pair Programming (Communication)

- Working together
- Better code
- Slower development
- Reduce
 - Bugs
 - Misunderstandings
 - Integration issues
 - Blame (unproductive)

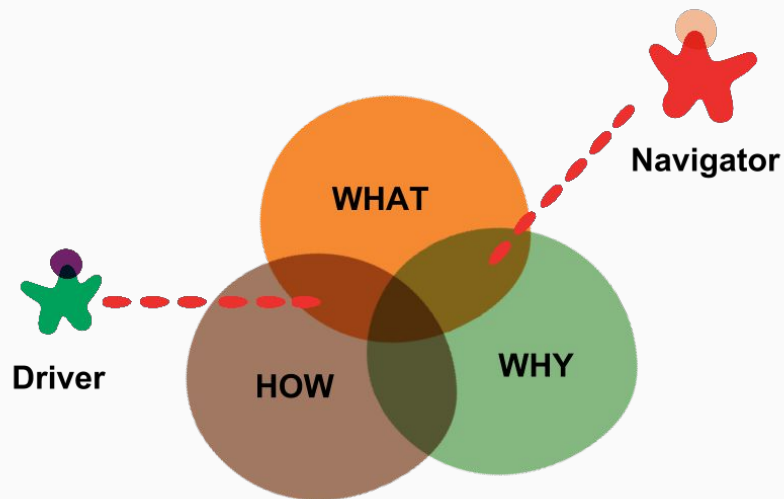


Pair Programming Roles

Driver has the keyboard.

Navigator focuses on big picture (and pedantic details).

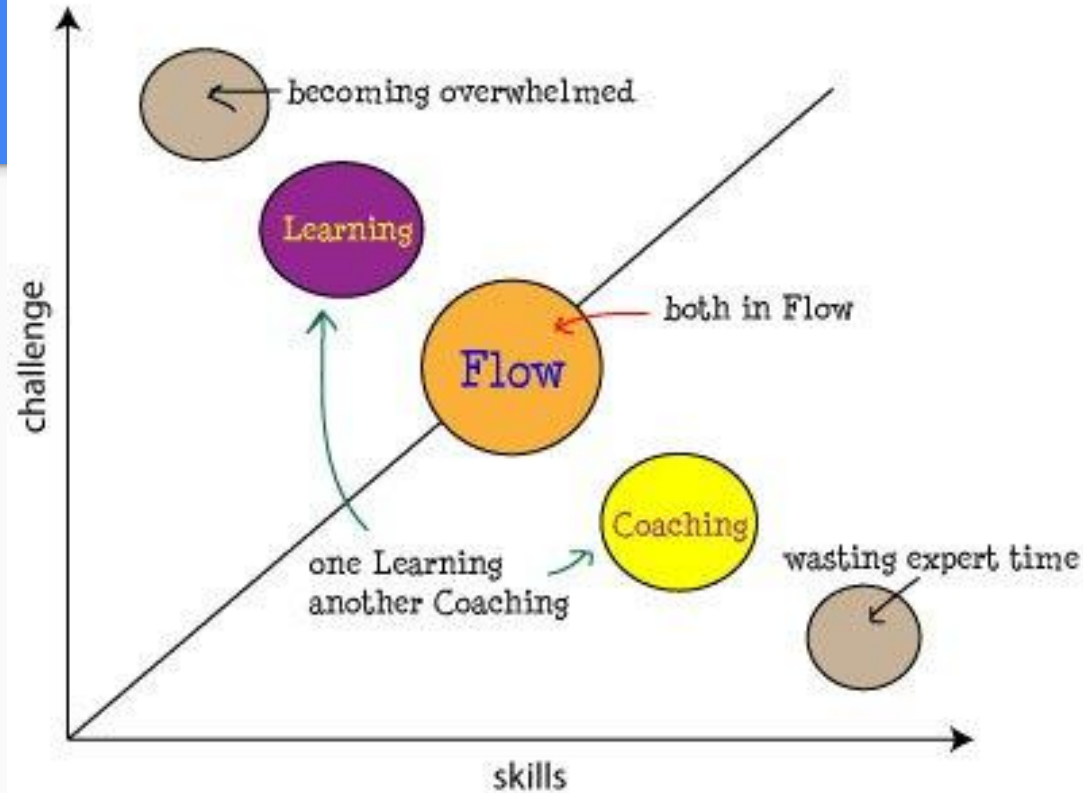
Swap roles.



Pair Modes

We are here to learn. There is no wasting expert time.

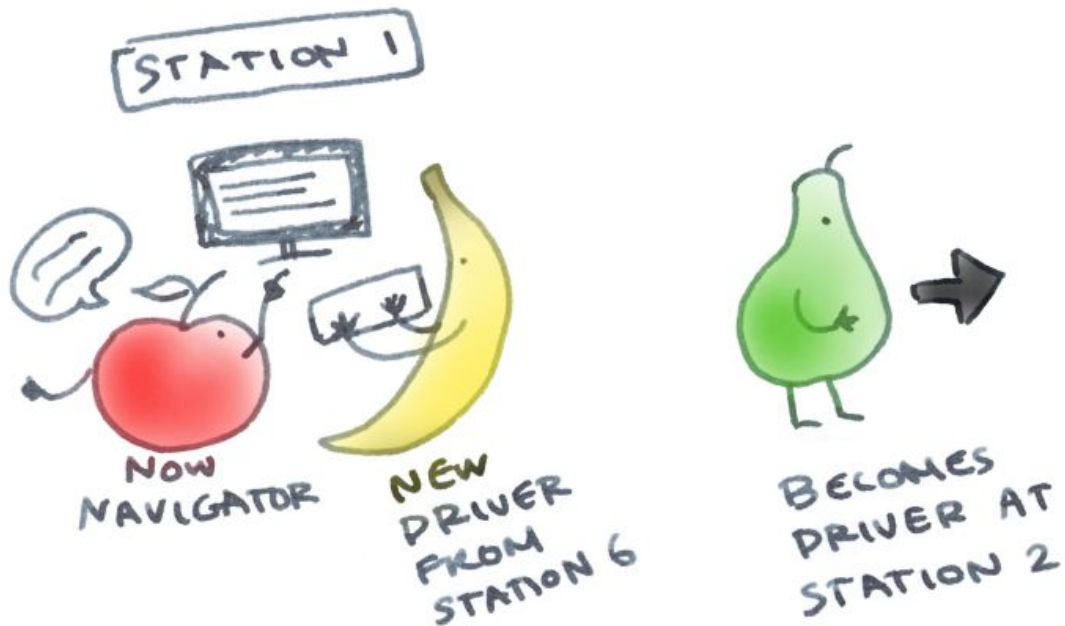
Pair Programming Modes



Rotate Pairs

Learn more about the system as a whole.

- Reduce
 - Bugs
 - Misunderstandings
 - Integration issues
 - Blame (unproductive)



Software Engineering:

Multi-*Person* Development
Of
Multi-*Version* Software

Git Exercises

Git: What is a *Commit*?

A *commit* is a snapshot of the files.

- file contents
- file properties
- file locations (e.g., directory it is in)

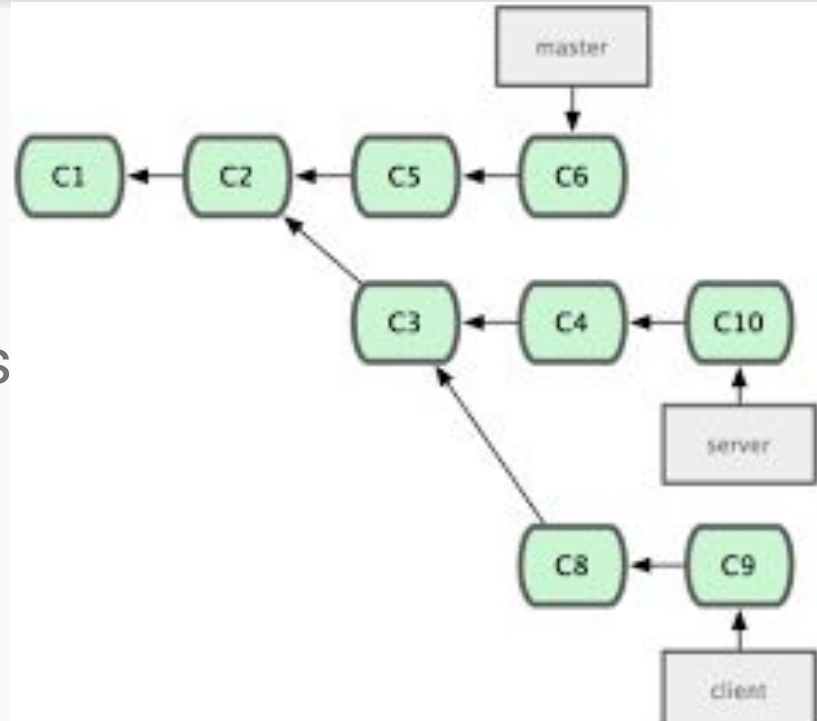
Git: History is a Tree (really a DAG)

Tree of Commits (rounded)

Commits point to parents.

Branches are names for Commits

- e.g., master, dev
- Not part of the tree!
- Just pointers in to the tree.



Git: Working Copy

The files you see on the file system.

Like a branch name: refers to a commit.

Plus the edits you make!

Object-Oriented Programming Exercise

A yellow callout box with a black outline and rounded corners. A thin black line points from the top-left corner of the box towards the word 'Exercise' in the title above.

See C# code listing.
Read & Understand.