Software Engineering Principles for Complex Systems - Project Workshop -

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Agenda (105’)

- Robocode
  - *Robocode Introduction and Demo (20’)*
  - *Hands on! (DIY) (20’~30’)*
- FeatureIDE
  - *Install FeatureIDE (DIY) (20’~30’)*
  - *Guided example in Antenna (20’)*
- Gitlab
  - *Try to access your gitlab repo (DIY) (5’)*

Join Mentimeter!

Web: www.mentimeter.com/

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OR

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OR scan me!

Robocode Introduction

Tobias Schwarz, Mazen Mohamad, Thorsten Berger, Wardah Mahmood

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What is Robocode?

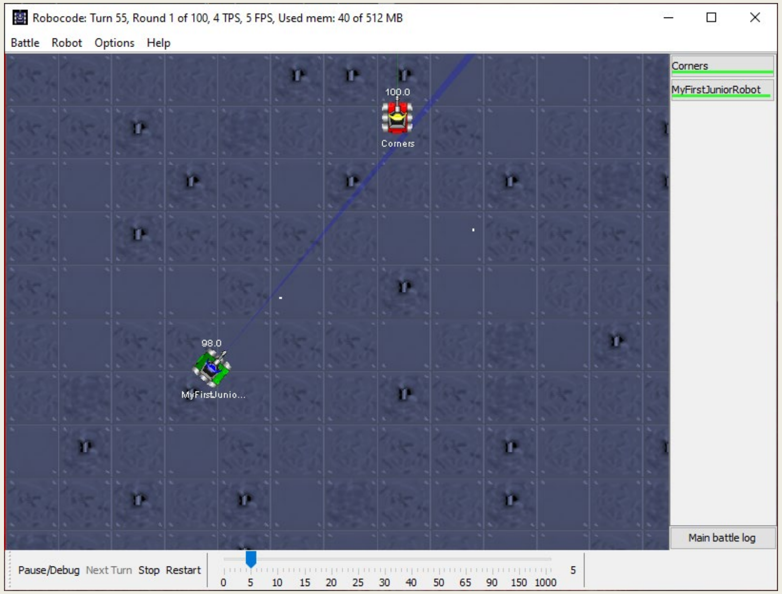
- Robocode is a programming game
  - *Provides a game engine to simulate robot competitions (battles)*
- You’re not directly controlling the robot, but programming it to manage the battle by its own
- Implement one or many Java classes how the robot behaves and reacts to its environment
- Robot competitions takes places

  on a simulated battlefield

- **Purpose of assignment:**

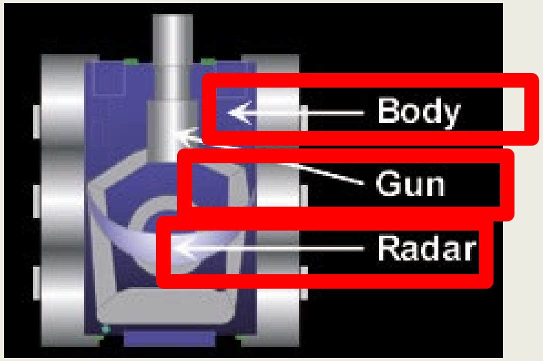
  Learn creating an SPL in a fun

  and interactive environment

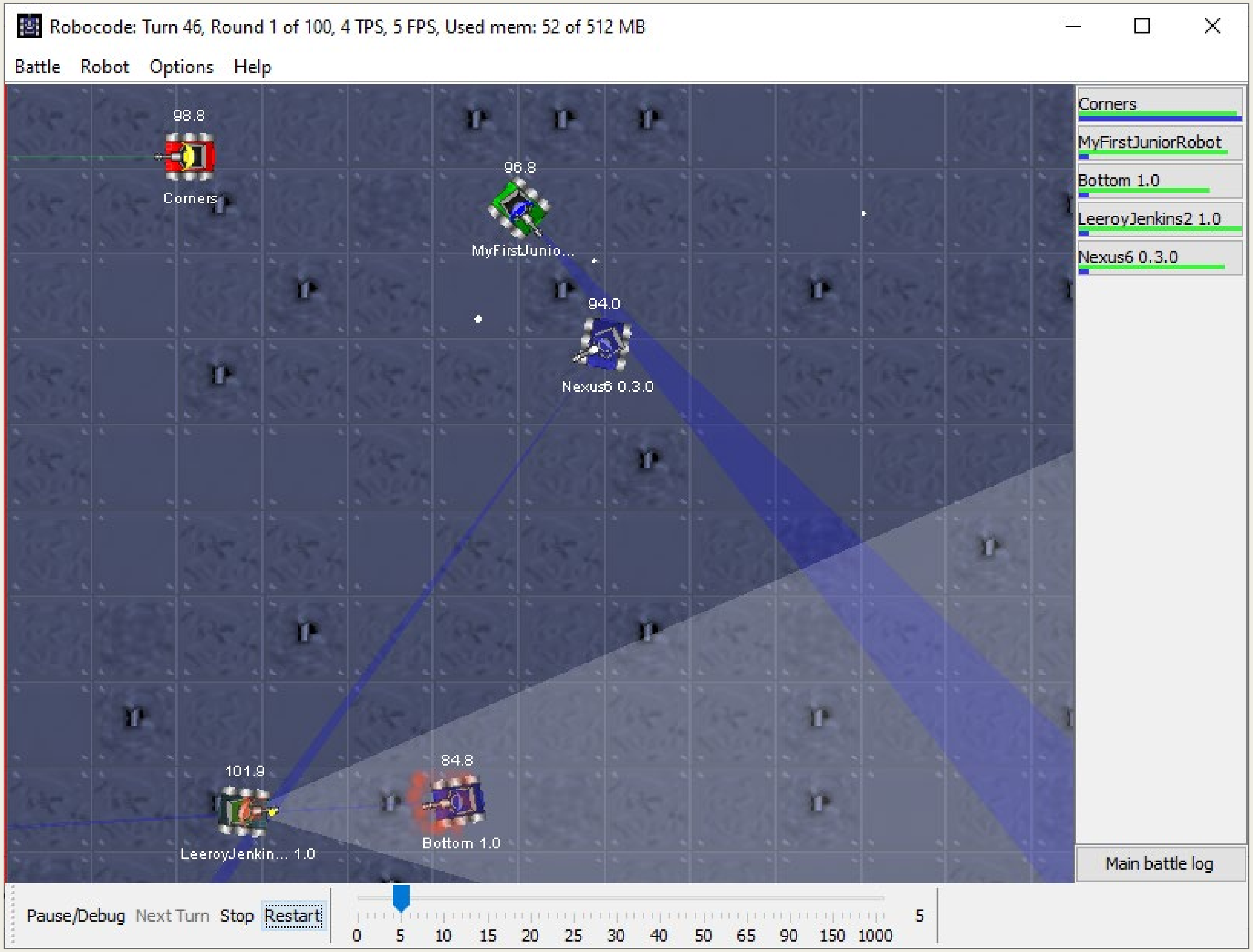


Robot Anatomy

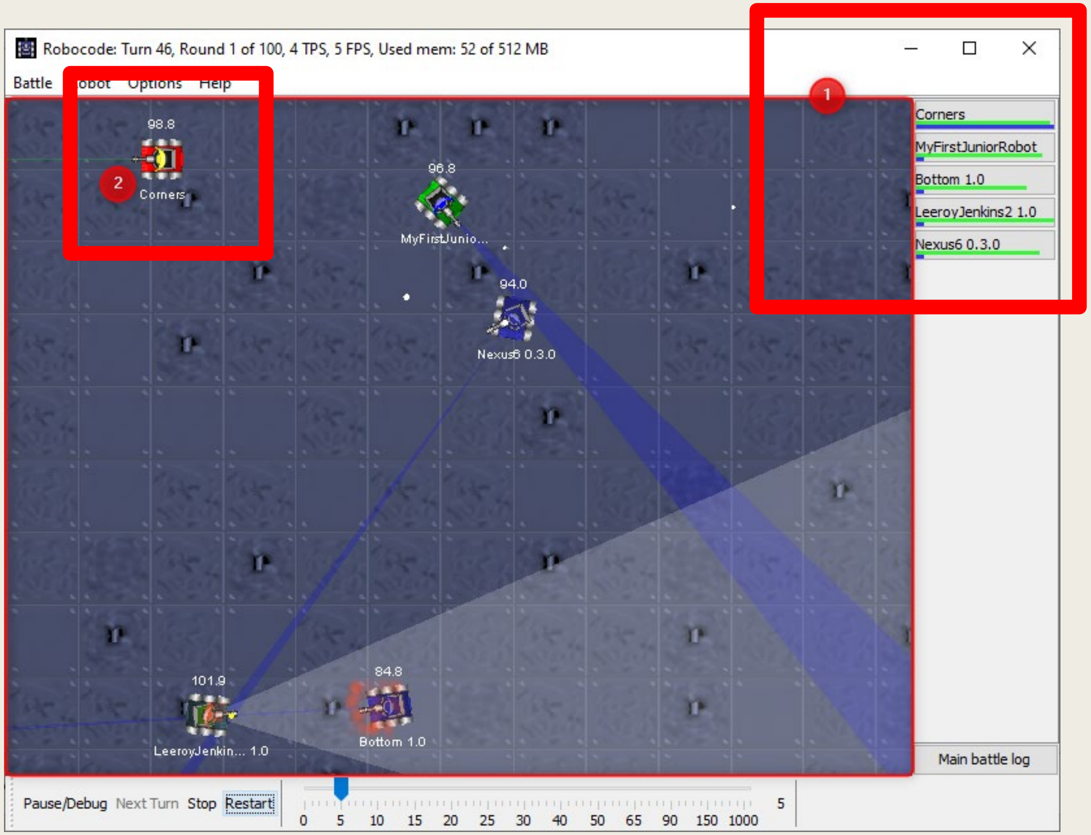
- **Body** – Carries the gun with the radar on top. The body is used for moving the robot ahead and back, as well as turning left or right.
- **Gun** – Mounted on the body and is used for firing energy bullets. The gun can turn left or right. Carries the radar on top.
- **Radar** – Mounted on the gun and is used to scan for other robots when moved. The radar can turn left or right.
- Each component has a set of associated strategies



The battlefield



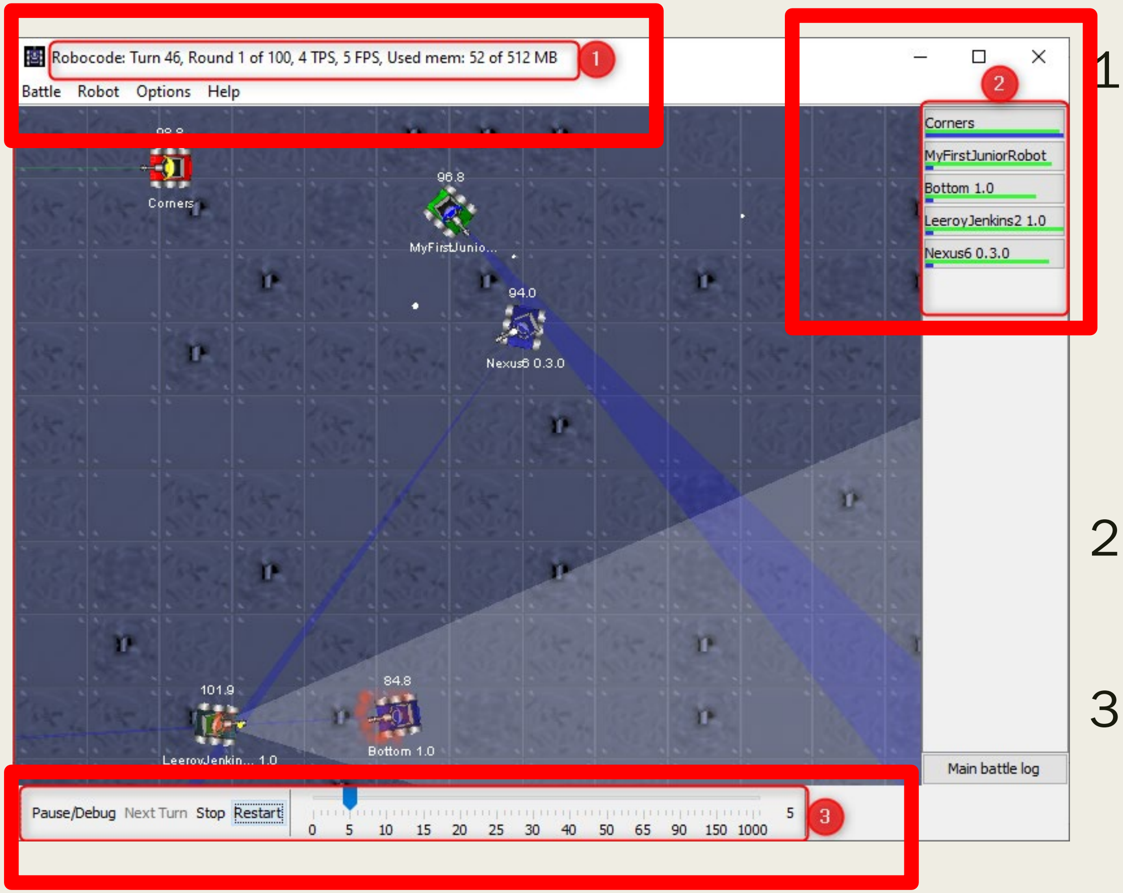
The battlefield



Robocode: Turn 46, Round 1 of 100, 4 TPS, 5 FPS, Used mem: 52 of 512 MB

1. Simulated battle
   - *Different robots*
   - *Radar*
   - *Bullets*
   - *Hit by bullet*
2. Individual robot
   1. *Health points (=98.8)*
   2. *Name (=Corners)*

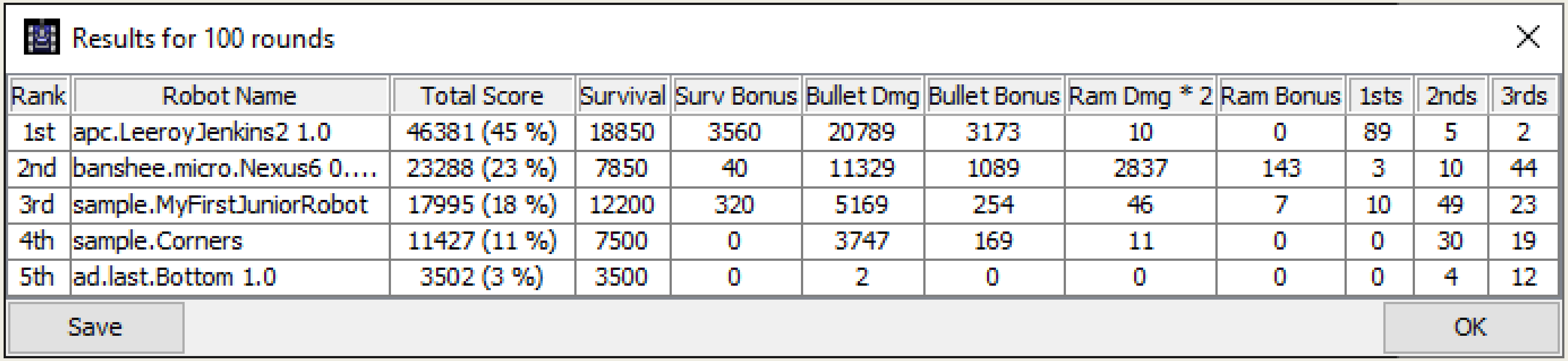
The battlefield



Robocode: Turn 46, Round 1 of 100, 4 TPS, 5 FPS, Used mem: 52 of 512 MB

1. Simulator information
   - *Turns/Ticks (time measure)*
   - *Round*
   - *FPS (1Tick per FPS)*
   - *Memory*
2. Robot information
   - *Name and health*
3. Simulation settings
   - *Pause/stop/restart*
   - *FPS setting*

The battlefield


Results for 100 rounds

Rank	Robot Name	Total Score	Survival	Surv Bonus	Bullet Dmg	Bullet Bonus	Ram Dmg * 2	Ram Bonus	1sts	2nds	3rds
1st	apc.LeeroyJenkins2 1.0	46381 (45 %)	18850	3560	20789	3173	10	0	89	5	2
2nd	banshee.micro.Nexus6 0....	23288 (23 %)	7850	40	11329	1089	2837	143	3	10	44
3rd	sample.MyFirstJuniorRobot	17995 (18 %)	12200	320	5169	254	46	7	10	49	23
4th	sample.Corners	11427 (11 %)	7500	0	3747	169	11	0	0	30	19
5th	ad.last.Bottom 1.0	3502 (3 %)	3500	0	2	0	0	0	0	4	12

- Rank
- Robot Name
- Total Score

- Points for
  - *Survival*
  - *Survival Bonus*
  - *Bullet Damage*
  - *Bullet Bonus*
  - *Ram Damage*
  - *Ram Bonus*
- Times won on position X

Live Demo

- With robots
  - *Sample.MyFirstRobot*
  - *Sample.Corners*
  - *Sample.RamFire*
  - *Sample.Crazy*

MyFirstRobot - Code explained

```
package pkg;

import robocode.*;

public class MyFirstRobot extends Robot {
    public void run() {
        while (true) {
            ahead(100);
            turnGunRight(360);
            back(100);
            turnGunRight(360);
        }
    }
    public void onScannedRobot(ScannedRobotEvent e) {
        fire(1);
    }
}

```

- **“Package”** for organizational purposes of robots in RoboCode Simulator
- **Import RoboCode library** to receive access to its functions

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```

- **“Main” class** of your robot
- **Extends Robot** / AdvancedRobot
  - *Robot = blocking calls*
  - *Ad.Robot = non-blocking calls*

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    }
}
```

- **Run()** for robot configuration
- **While-loop** contains basic behavior; always executed when no on-events, e.g. onScannedRobot
- In this example:
  - *Continue loop until health points run out or onScannedRobot is called*

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```

- **Ahead** – Pixels to move
- **turnGunRight** – Degree to turn gun attached radar
- In this example:
  1. *Move ahead 100 pixels.*
  2. *Turn the gun right by 360 degrees.*
  3. *Move back 100 pixels.*
  4. *Turn the gun right by 360 degrees again.*

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```

- **Event handling code** on certain event and implementation about action to take
  - ***onScannedRobot()***
  - ***onHitByBullet()***
  - ***onHitWall()***
  - ***...***
- Callout contains information about event, such as scanned enemy robot

Further reading

- Learn more about movement, targeting and firing

  Highly recommended:

  - *https://www.ibm.com/developerworks/java/library/j-robocode/*
  - *https://robocode.sourceforge.io/docs/robocode/*

  Recommended:

  - *https://www.ibm.com/developerworks/java/library/j-robocode2/j-robocode2-pdf.pdf*
  - *http://robowiki.net/ (Chalmers Mirror) -> Radar, Targeting, Movement, Tutorials*

Further reading

- RoboCode FAQ
- Basic knowledge in trigonometry (used to targeting, movement and avoid getting hit): https://www2.clarku.edu/faculty/djoyce/trig/
- Secrets from the Robocode masters https://robocode.sourceforge.io/developerWorks.php
- http://mark.random-article.com/robocode/
- Interests of research
  - *Applying Machine Learning to Robocode*
  - *Deep Q-Learning for Robocode*

Hands on Robocode!!
DIY/20’

Hands on Robocode!! (DIY/20’~30’)

- Download and install required robocode (https://robocode.sourceforge.io)
- Build your first own robot
- Run a competition with your own robot

<u>Any questions?</u>

1st ask your colleagues
2nd raise your hand
3rd look for your TA

<u>Are you done already?</u>

1st answer mentimeter
2nd help your teammates
3rd wait till next session.

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Install FeatureIDE + Eclipse DIY/20’~30’

Install FeatureIDE + Eclipse (DIY/20’~30’)

- Download and install FeatureIDE (https://featureide.github.io/)
  Versioning: Java 17, FeatureIDE 3.9, and Eclipse 4.20
  - *Install Java 17 in your computer*
  - *Enter the FeatureIDE website and download (newest version)*
  - *Open Eclipse, create a new FeatureIDE Project (fiddle around)*

Any questions?

1st ask your colleagues
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Guided Example with Antenna 20’

Ricardo Caldas, Mazen Mohamad, Wardah Mahmood,
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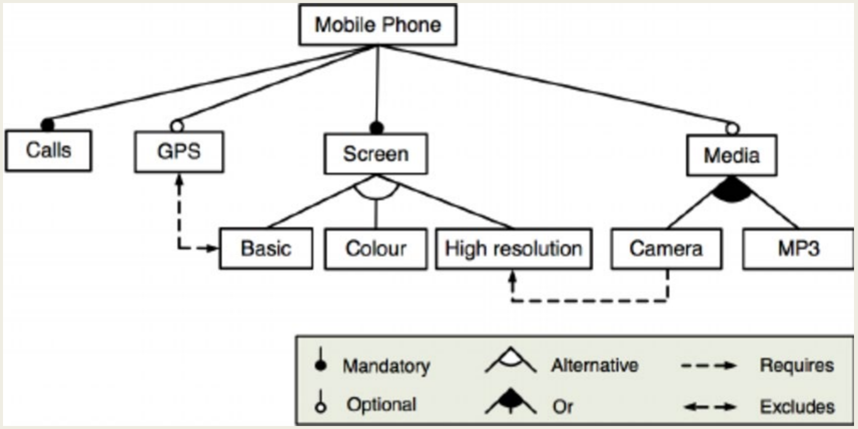
FeatureIDE

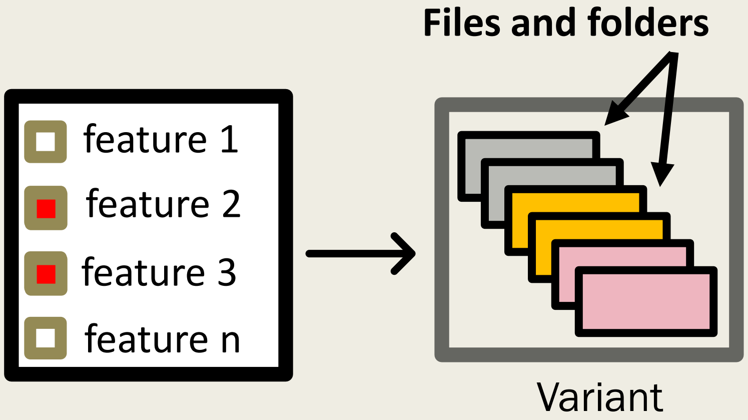
- A Java plugin
- Allows you to:
  - Create feature models
  - Add features in code



- **Feature model:** Tree like structure with features
- **Feature:** Anything meaningful to a user

Why add features into code?

- To allow *configuration*
- **Configuration:** Generating variants with selected features.
- **Sneak peak into assignment 3: Find** features in Robocode codebase, and label them. Generate Robocode variants.



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Guided Example with Antenna (20’) – Follow along!

- [New Project] >> Example… >> FeatureIDE Examples
- Expand Antenna >> Select HelloWorld-Antenna >> Finish
- Change the Feature Model (model.xml)
- Change the Configuration File (BeautifulWorld.xml)
- Insert new feature in the code (HelloWorld.java)
- Observe that changing the configuration also changes the code! Isn’t it cool?!

Are you done already?

1st answer mentimeter
2nd help your teammates
3rd wait till next session

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Gitlab Repo Assessment
(5’)

Can you access the Gitlab repo assigned to your group? (5’)

- Try to enter the following webpage:

https://git.chalmers.se/courses/tda594/2022_groups/group-X

where X is the number or your group

Didn’t work??

Call your TA.

Did it work??

Answer mentimeter and submit your answer.

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Thanks for today!

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