



Centrum Wiskunde & Informatica



**Hogeschool van Amsterdam**  
Amsterdam University of Applied Sciences

# Adapting Game Mechanics with Micro-Machinations

Seminar Automated Game Design

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HvA / Create-IT applied research &

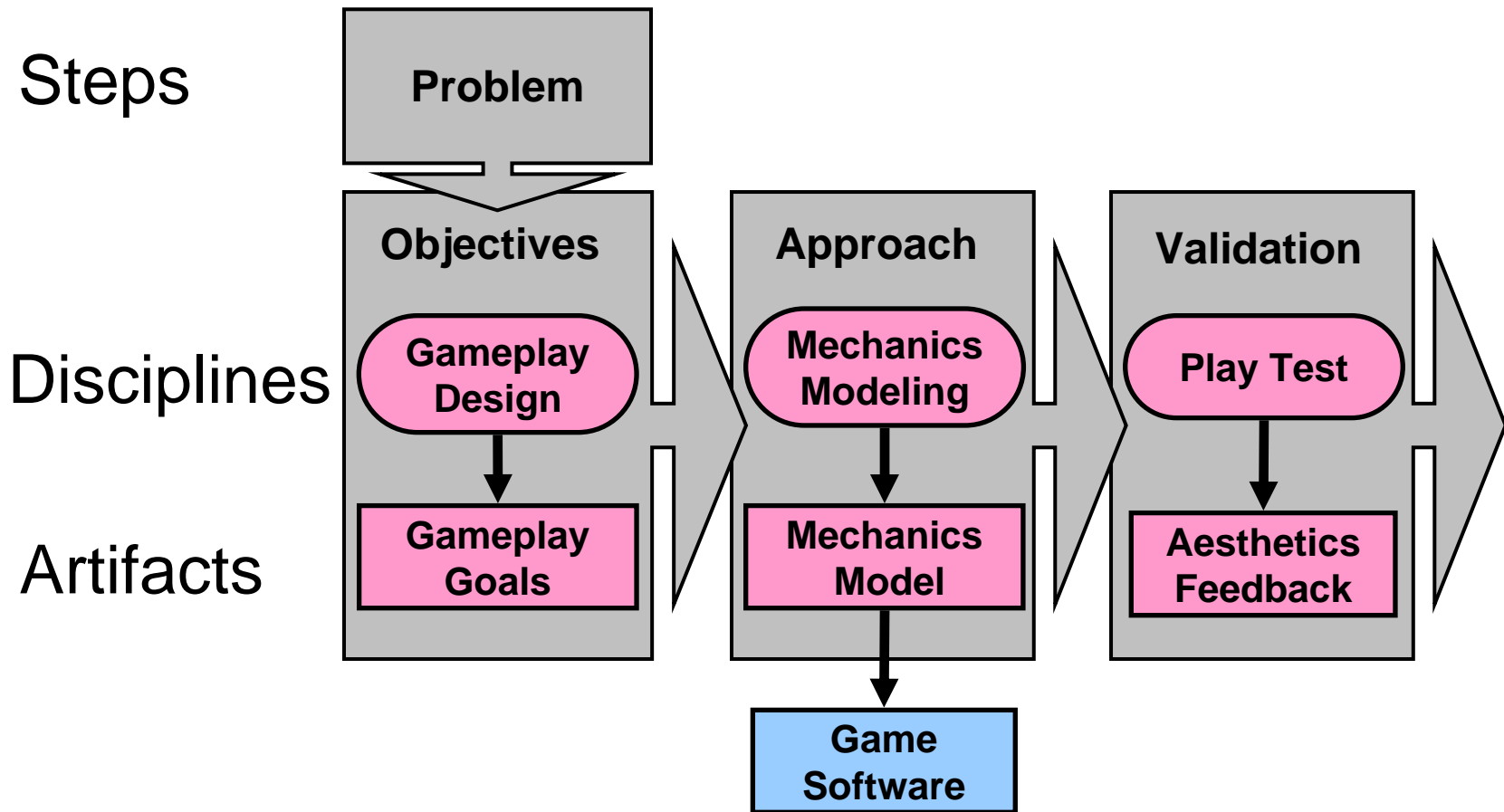
CWI / Software Analysis and Transformation (SWAT) group

Joint work with  
Joris Dormans

# Workshop

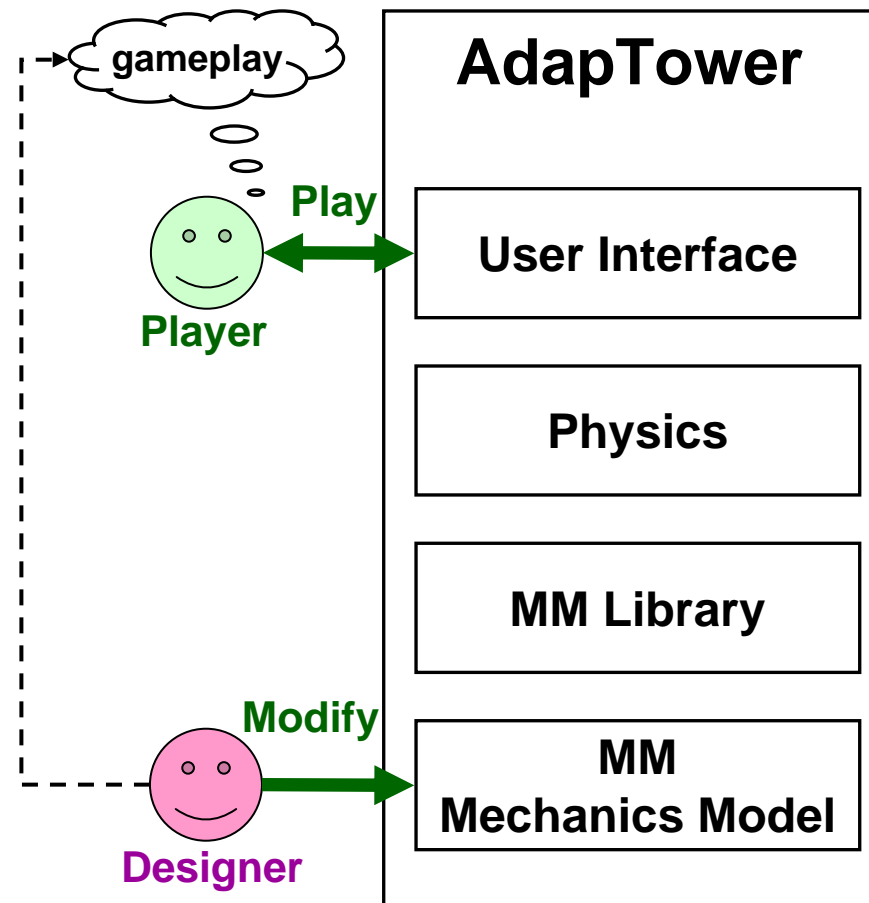
- Goals
  - Share information about Micro-Machinations
  - Demonstrate interactive game adaptations
  - Think about practical applications
  - Discuss limitations
  - Discuss future directions

# Workshop Strategy



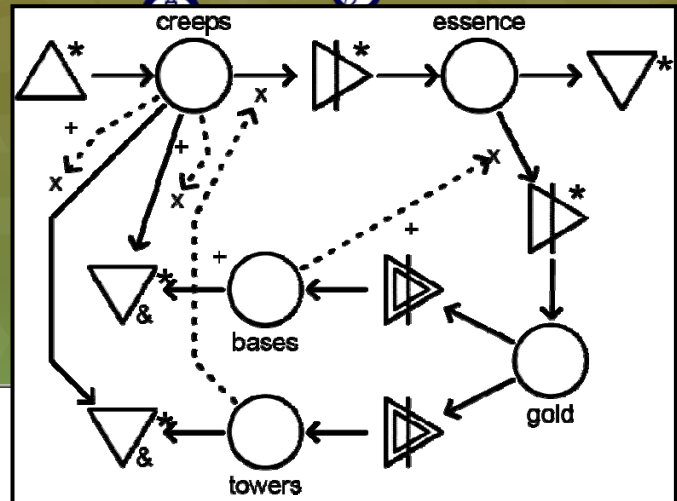
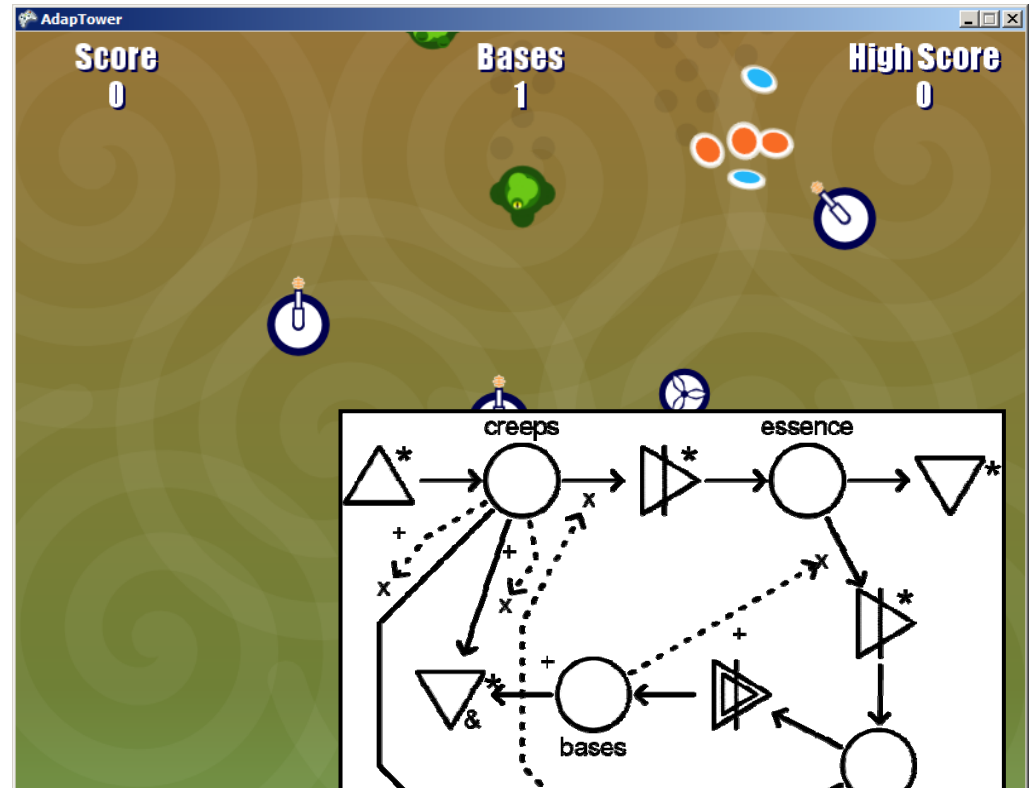
# AdapTower: Workshop Case

- Prototype game in the Tower Defense genre
- Embeds the MM Library
  - Written in C++
  - ‘platform independent’
  - 3-clause BSD License
  - [github.com/vrozen/MM-Lib](https://github.com/vrozen/MM-Lib)
- Example demonstrates how MM can be used to adapt game mechanics → gameplay



# AdapTower: Gameplay Design

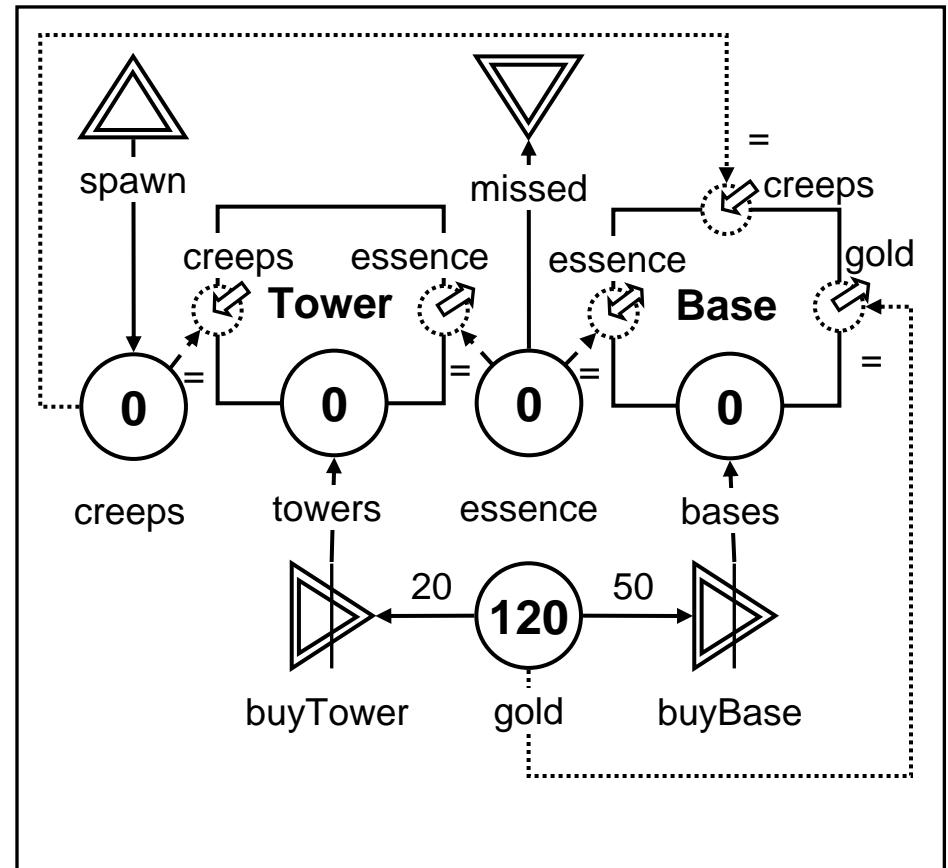
- Creeps spawn into the world
- Two kinds of buildings
  - Towers
    - kill creeps
    - produce essence
  - Bases
    - catch essence
    - produce gold
- Players can spend gold
  - Start with 120 gold
  - Buy a tower for 20 gold
  - Buy a base for 50 gold



Early Game Mechanics Sketch

# AdapTower: Mechanics Modeling

- Creeps spawn into the world 
- Two kinds of buildings
  - Towers
    - kill creeps
    - produce essence
  - Bases
    - catch essence
    - produce gold
- Players can spend gold
  - Start with 120 gold
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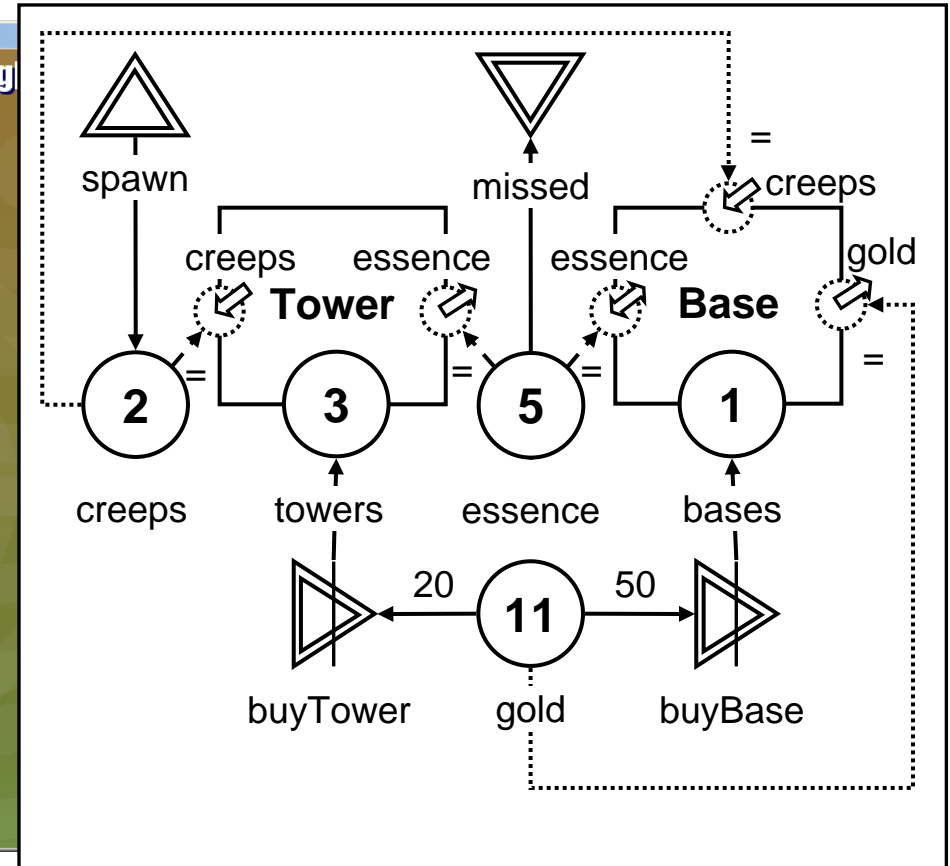


Visual Micro-Machinations

# AdapTower: Mechanics Modeling



Let's count the number of creeps, towers, bases, essence and gold



Visual Micro-Machinations run-time state

# AdapTower: Play Testing

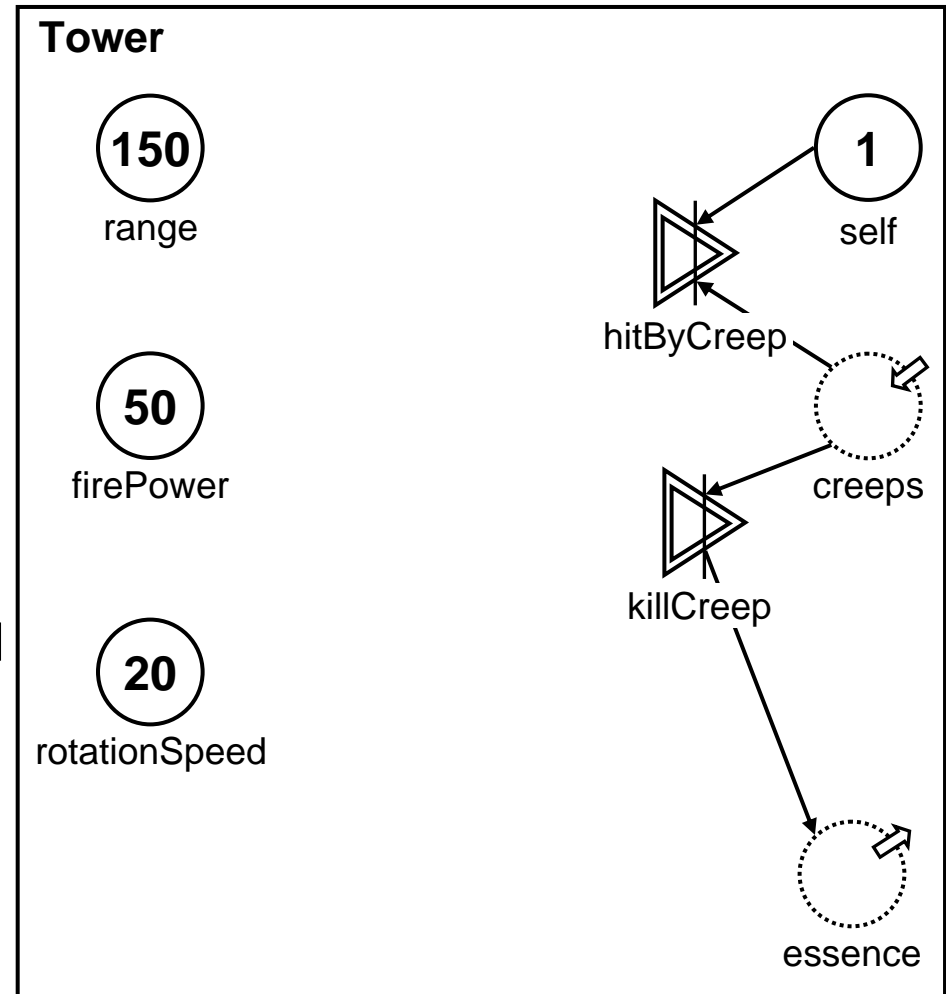
- Group Assignment 1
  - Play test the game together.
  - Do you see problems with the gameplay?
- Perceived Problems
  - Players set up towers and bases and then have to wait
  - Unexciting experience





# AdapTower V2: Mechanics Modeling

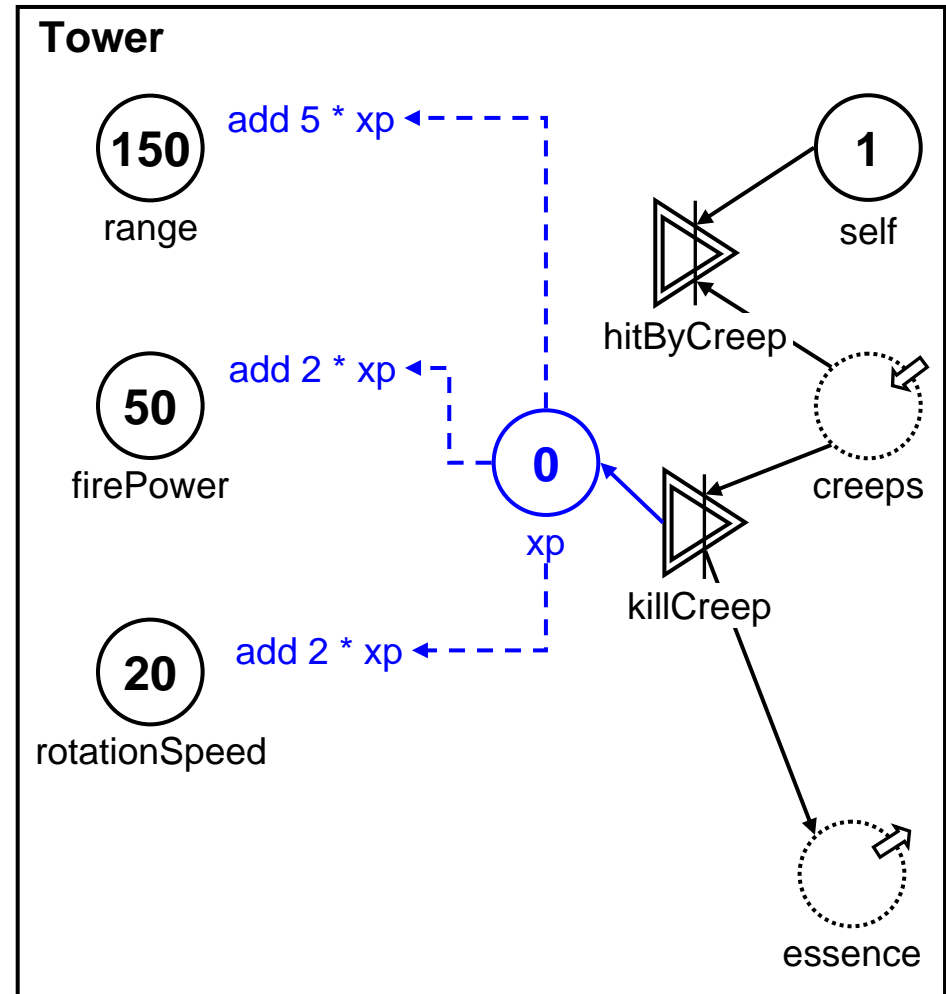
- Objectives
  - Make positioning of towers important and speed up end-game
- Group Assignment 2
  - Model Mechanics modifications together.
  - Add a feedback loop to Towers such that towers gain experience (xp) based on kills and provide a bonus to range, firePower and rotationSpeed
  - **Hint:** pools and resource connections are at the top of the cheat sheet



Visual Micro-Machinations of the Tower Definition

# AdapTower V2: Mechanics Modeling

- Possible solution
  - Add pool xp
  - Add a resource connection between killCreep and xp
  - Modify range adding an expression
  - Modify firePower adding and expression
  - Modify rotationSpeed adding and expression



Visual Micro-Machinations of the Tower Definition

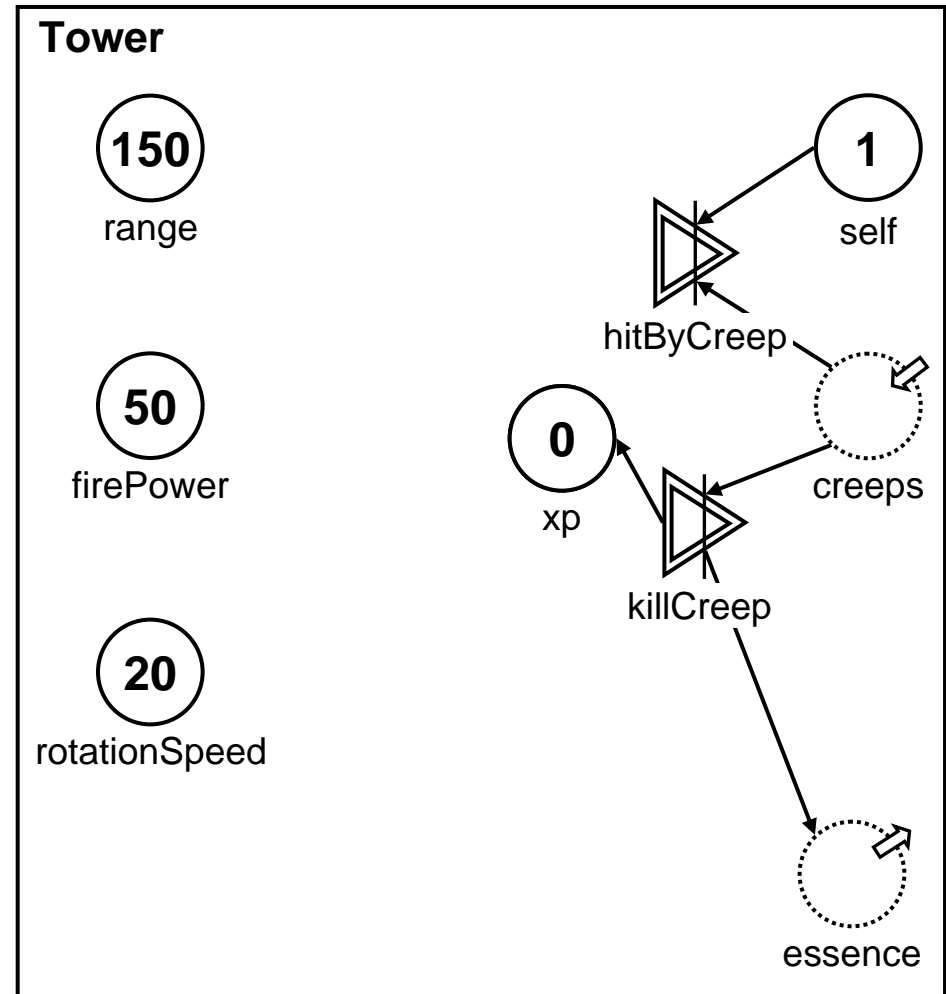
# AdapTower: Play Testing

- Group Assignment 3
  - Play test the game together.
  - Do you see problems with the gameplay?
- Perceived Problems
  - Towers easily become too strong
  - No interesting choices
  - All towers act alike
  - Unexciting experience



# AdapTower V3: Mechanics Modeling

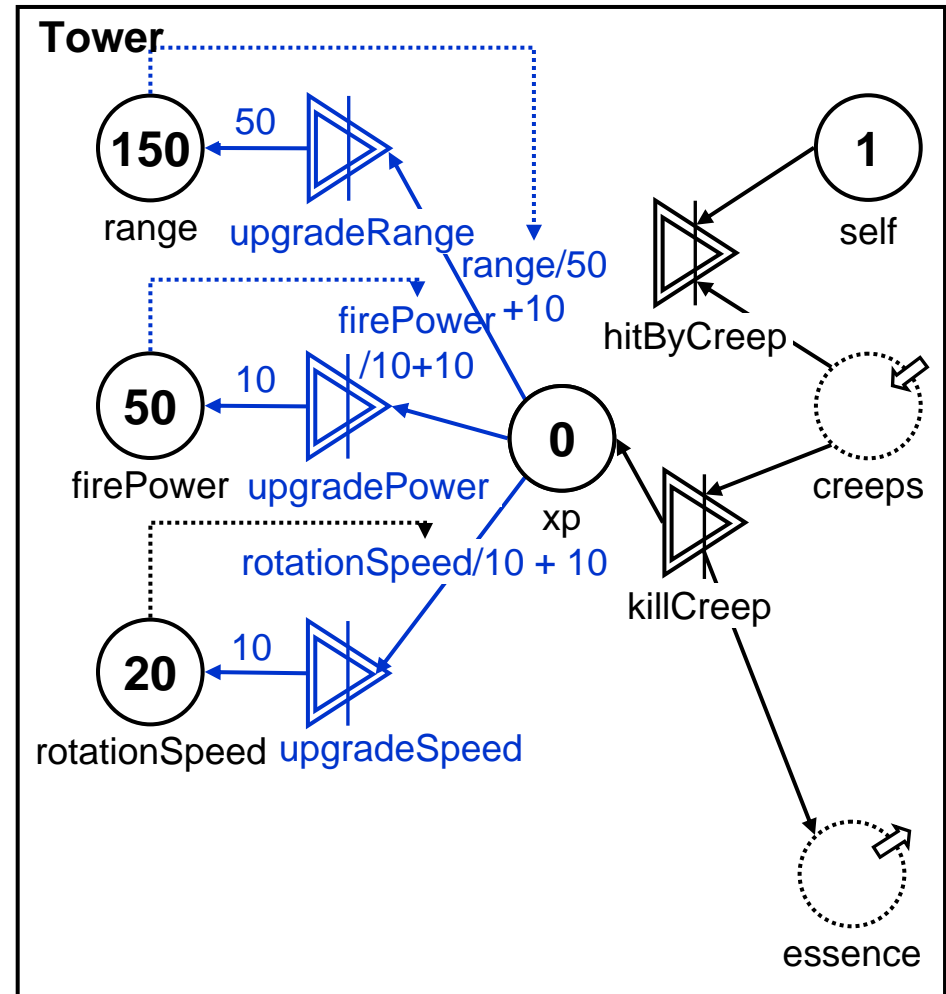
- Objectives
  - Allow players to choose spending xp specializing towers in different ways
- Group Assignment 4
  - Adapt the mechanics model together.
  - Add user upgrades for range, firePower and rotationSpeed spending xp
  - **Hint:** use interactive nodes



Visual Micro-Machinations of the Tower Definition

# AdapTower V3: Mechanics Modeling

- Possible solution
  - Remove the xp bonus to range, firePower and rotationSpeed
  - Add converters upgradeRange, upgradePower, upgradeSpeed
  - Add resource connections from xp to the converters specifying the costs
    - The costs increase!
  - Add resource connections from the converters to the pools specifying the gain
    - The gains are constant.



Visual Micro-Machinations of the Tower Definition

# AdapTower V3: Play Test

- Group Assignment 5
  - Play test version 3 of the game together.
  - Do you see problems with the gameplay?
- Perceived problems
  - None, it's a perfect game!
  - No wait...



# Concluding slide: What's next?

- Free adaptations
  - Do you have ideas to make the game fun?
- Discuss applicability MM
  - Think about practical applications
  - Discuss limitations
  - Discuss future directions
    - Mixed-initiative model-driven game design
- Questions?

# AdapTower: Other ideas

- Adding hitpoints
- Adjusting the fire rate
- Selling a tower
- Modifying the amount of essence generated



- Modifying Base

