Embedded Software Engineering 05/06 AD&R – Advanced Dungeons and Robots

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Motivation

- ➲ Butler James pattern
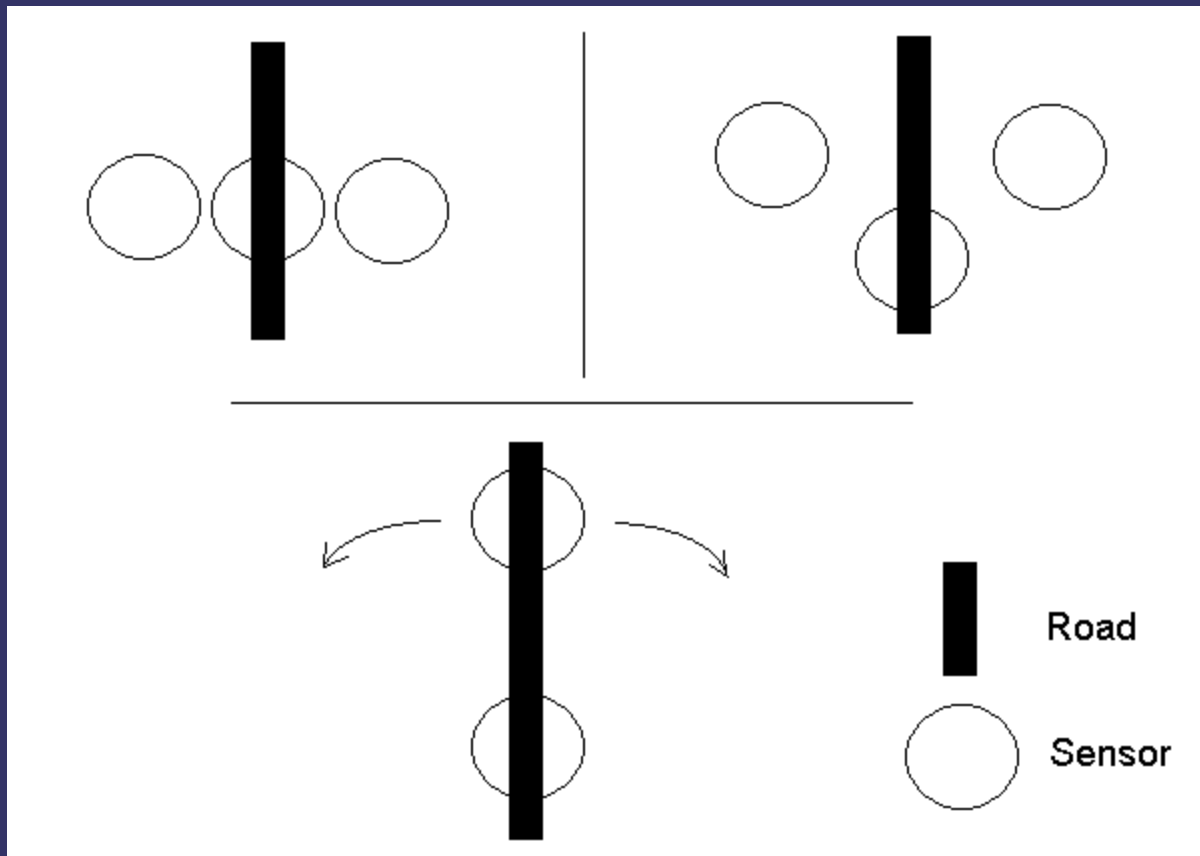- ➲ improve pathfinding
- ➲ improve robustness of HW&SW
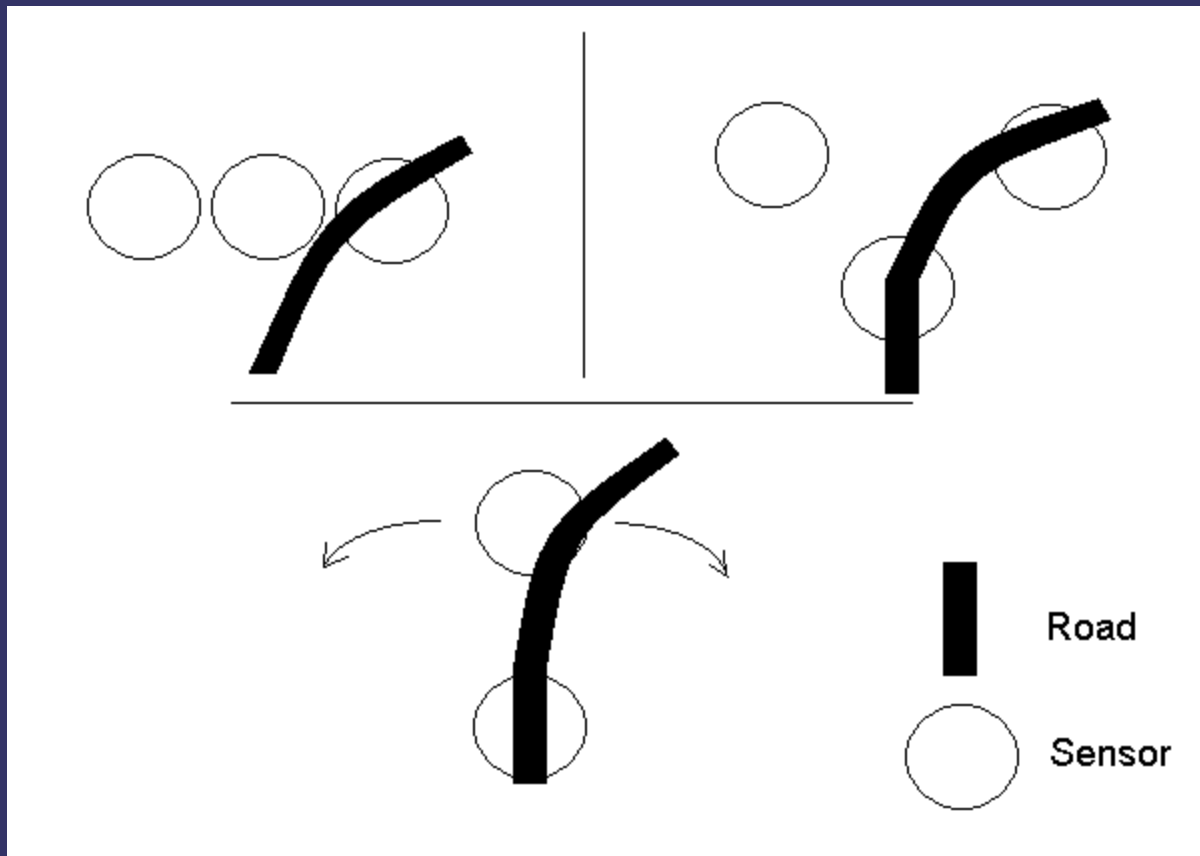
Sensor Array Concepts

➲ requires at least 3 sensors

➲ off-road problem

➲ 3 light sensors vs 2 light and 1 rotation sensor
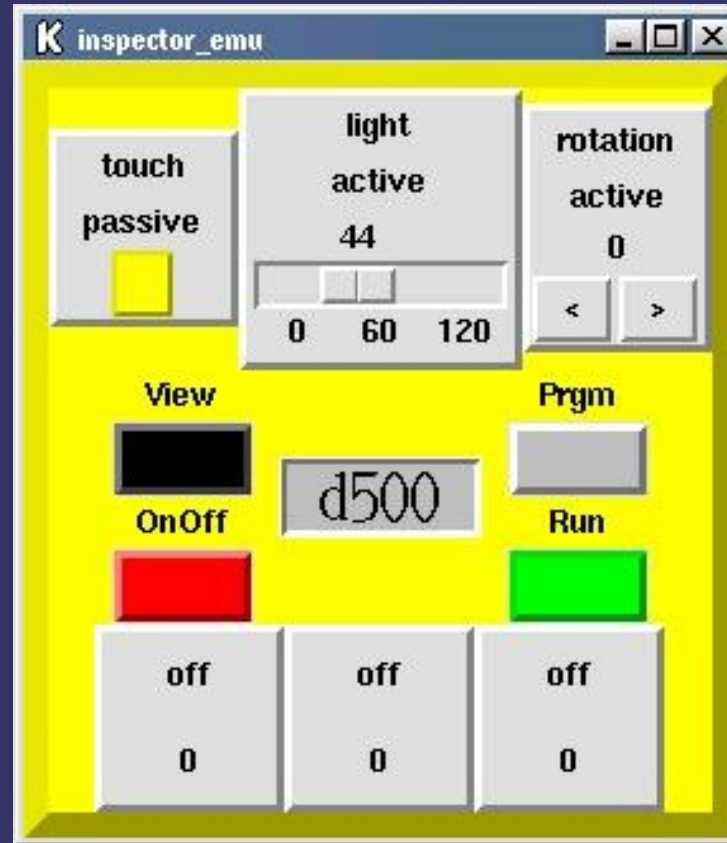
Sensors

Road

Sensor

Sensors

Road

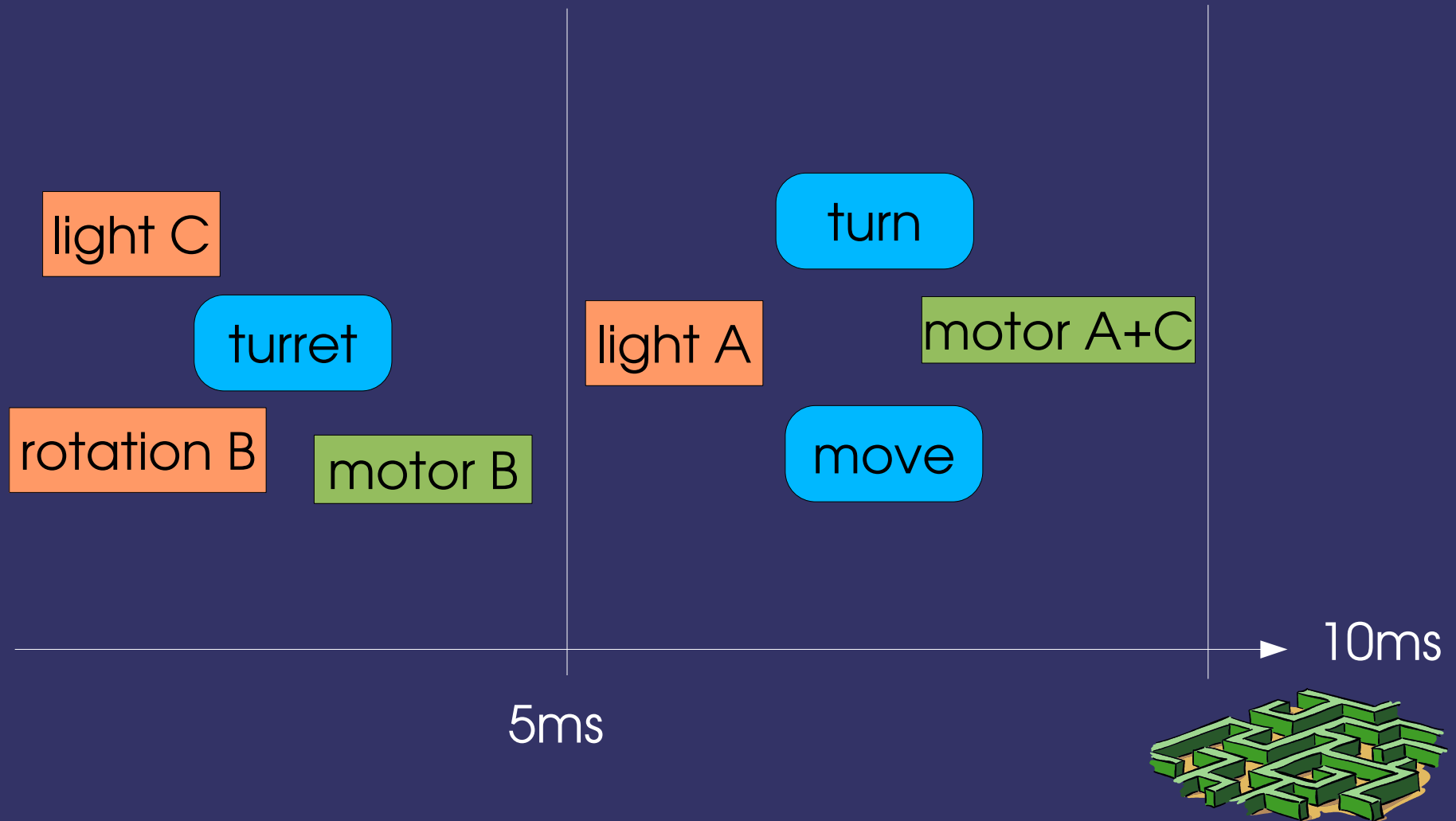Sensor

Software

- ➲ Brick OS
- ➲ Emu-Legos

E/S – Code implementation

- ➲ vm.c: high level control/scheduling
- ➲ panzer.C: low level sensor/actuator/logic
- ➲ vm.c: virtual machine implementation
- ➲ compilation flow

panzer.vm → panzer.C / vm.c / bytecode.c → panzer.lx

Tasks

light C

turret

rotation B

motor B

light A

turn

motor A+C

move

5ms

10ms

VM code

```
start:
    release 5 do_turret
    if check_turn turn

move:
    release 5 do_move
    future 10 start
    return

turn:
    release 5 do_turn
    future 10 start
    return
```

```
s00:
    dispatch 0 do_move
    dispatch 0 do_turn
    dispatch 0 do_turret
    jump s00
    return
```

Tasks (1)

- ⮐ check_turn
  - Checks if robot is on path (returns 1 or 0)
- ⮐ do_move
  - makes the robot moving forward with a given speed
- ⮐ do_turn
  - if robot is not on the path-> robot is rotating on it's position

Tasks (2)

⮕ do_turret
- turret moves constantly from left to right and vice versa
- checks if a curve is about coming

Implementation Issues (1)

⮑ turret and path problem
- turret recognizes black path and saves wrong direction
- area is defined where turret doesn't saves direction
- trade off: limitation of the path finding algorithm

Implementation Issues (2)

⮑ turret may not be able to recognize curve
- robot is moving forward and turret is relatively slow
- turret may miss path-> robot is moving forward without rotating
- solution: robot moves turret left to right and vice versa and only now his moving forward

Further work

➲ robot could remember decisions of going left or right
➲ robot generates a map of the "dungeon" and this enables him to find through one