

Mobile Robotics

Motivation: Integration of Interdisciplinary Concepts

- Digital Electronics
- Analog Electronics
- Microprocessor/Microcontroller Applications (Hardware Development)
- Software Development (Assembler, C)
- Computer controlled (assisted) instrumentation
- Digital signal processing (DSP)
- (Intelligent) Transducers (sensors)
- Principles of automatic control

Additional Experiences:

- Team Work
- Project Management



Strategie

- **Competition to promote motivation and enthusiasm**
- **Contest rules**
- **Availability of sufficient facilities and resources**
- **Meetings to give technical support**
- **Group communication (group meetings, Internet)**
- **Final Event (festival)**
- **Prizes**



Mobile Robotics

Objective: Construction of Mobile Robots

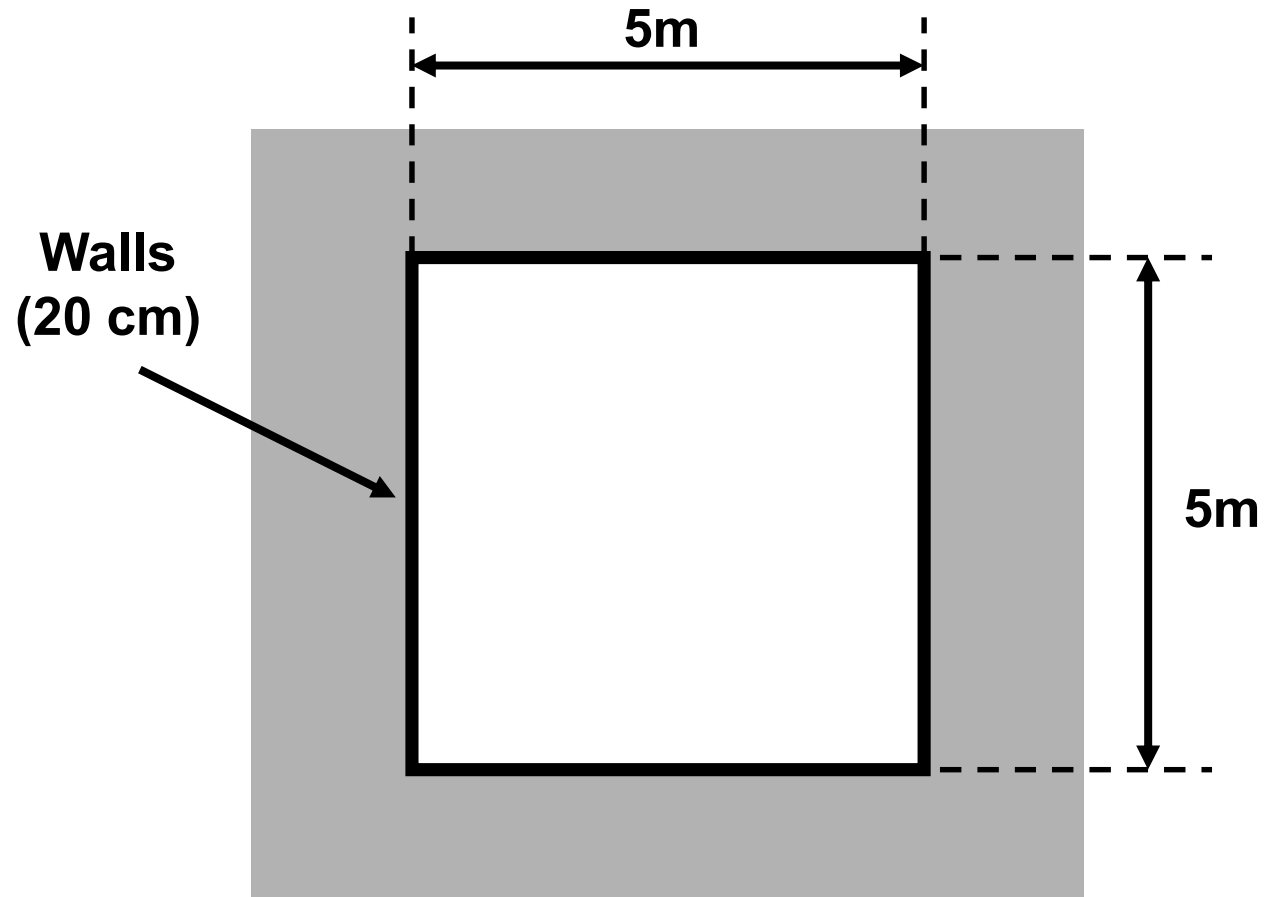
- **Hardware**
- **Software**

Basic Components:

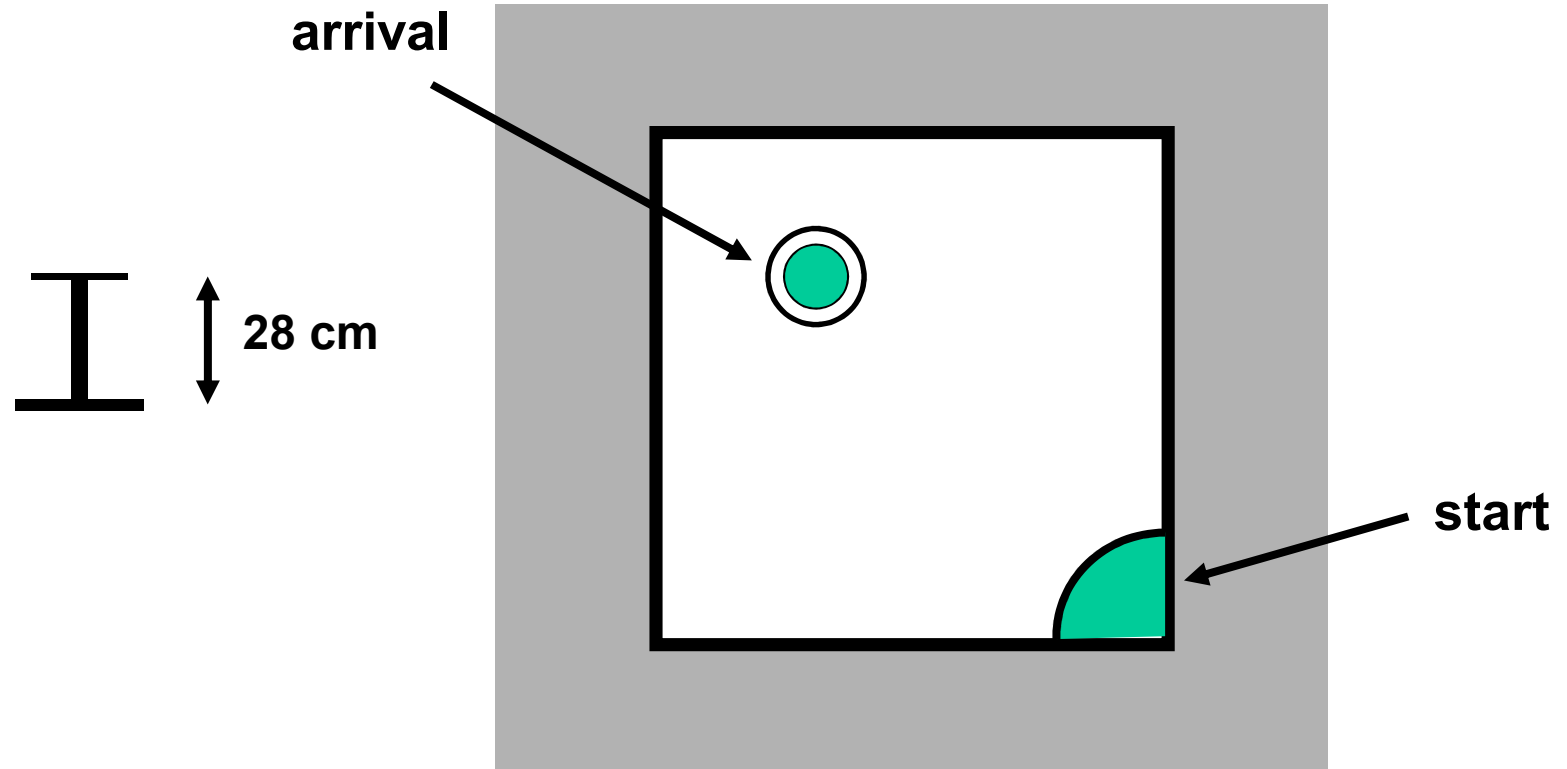
- **Motors**
- **Sensors**
 - Proximity
 - Beacon detector
 - Sensor for arrival area
- **Control Board (PCB)**
- **Batteries**
- **Base**



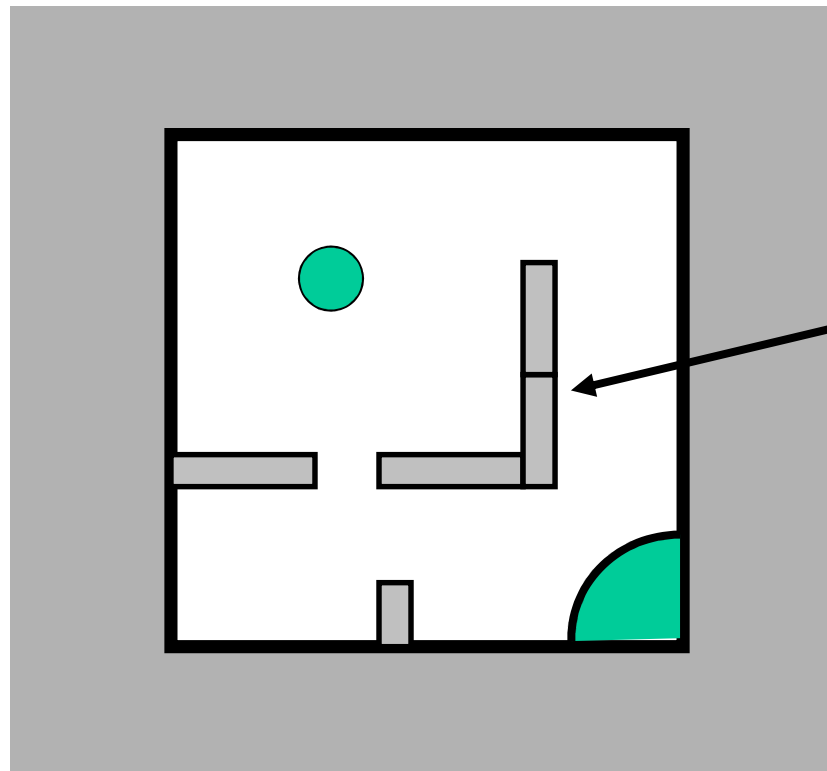
Labyrinth Construction



Labyrinth Construction



Labyrinth Construction



obstacles



Classification

Result:

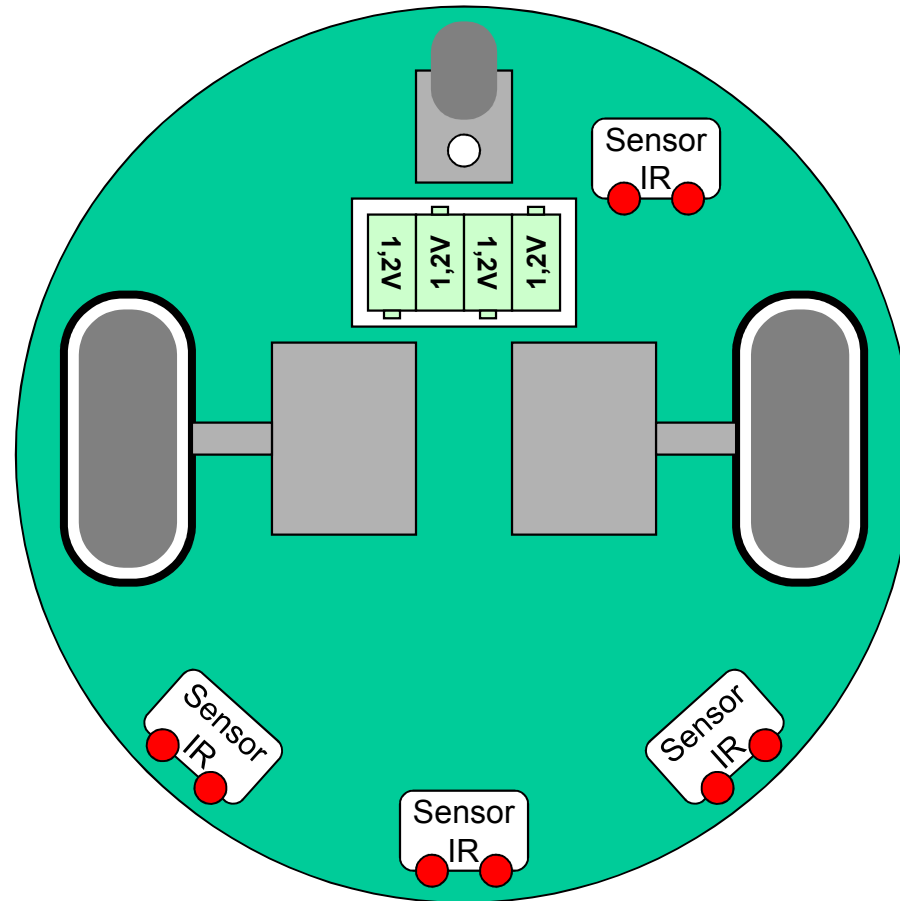
time = measured time + penalties

Penalties:

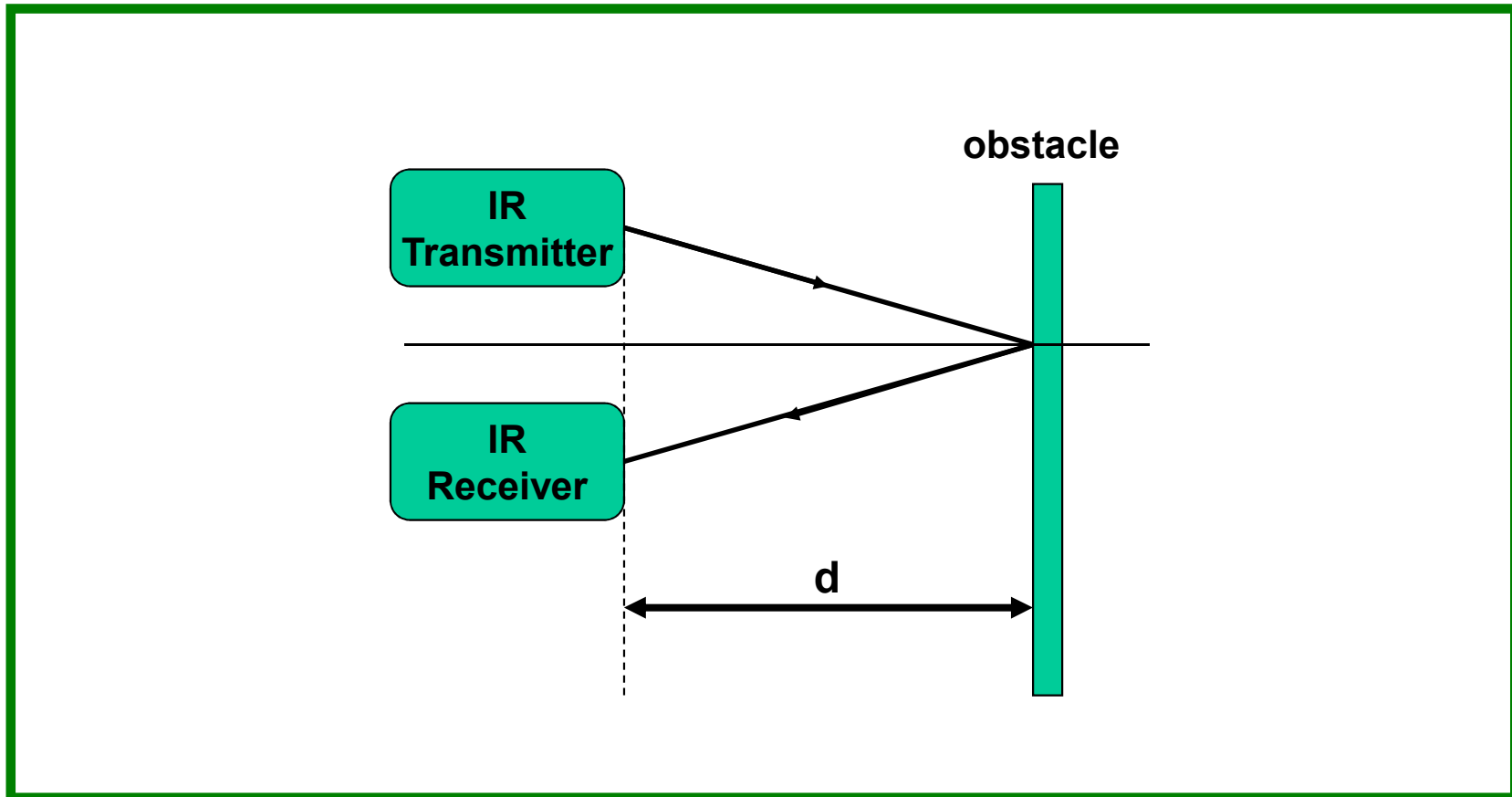
Collision:	11 s
Collision with alteration:	16 s
Arrival without indication (LED):	7 s
Arrival outside area:	9 s
No Arrival:	3 min



Mobile Robotics: Base

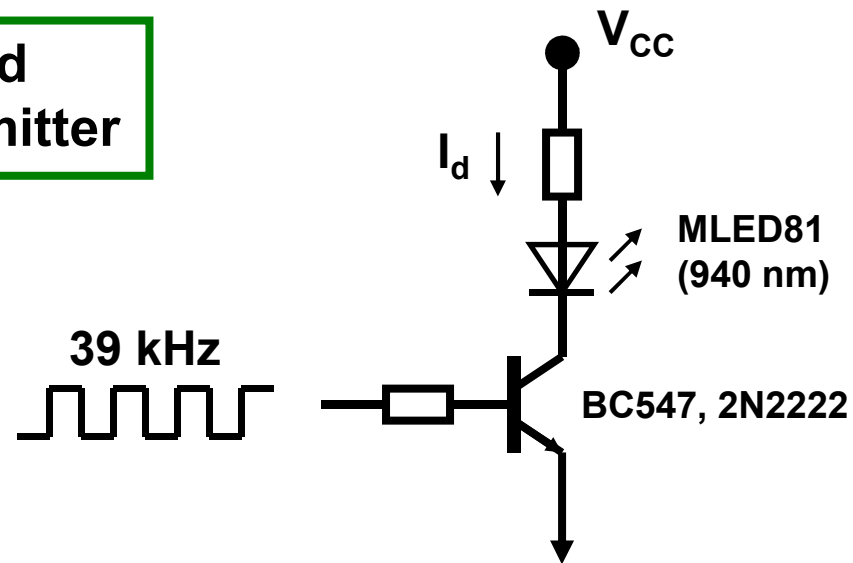


Proximity Sensor (Infrared)



Proximity Sensor (Infrared)

Infrared
Transmitter

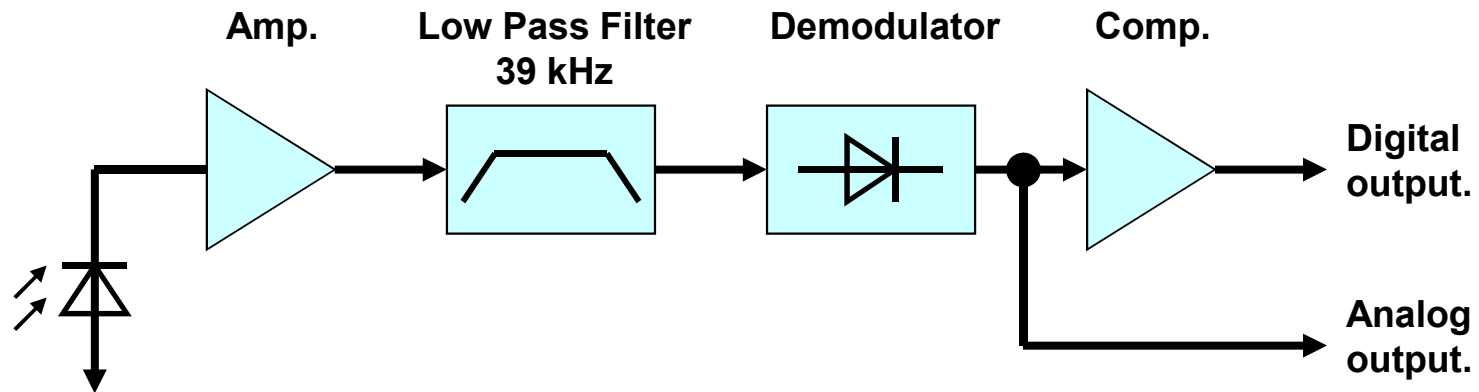


$$I_d \approx 10 \text{ mA}$$

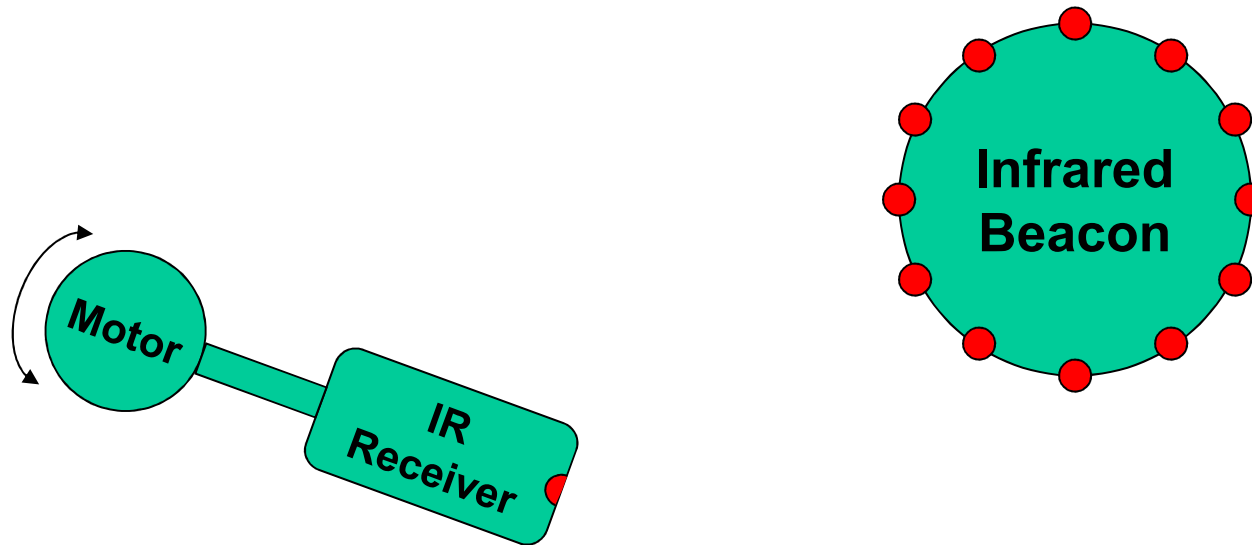


Proximity Sensor (Infrared)

Infrared Receiver Sharp GP1U58



Beacon Sensor (Infrared)

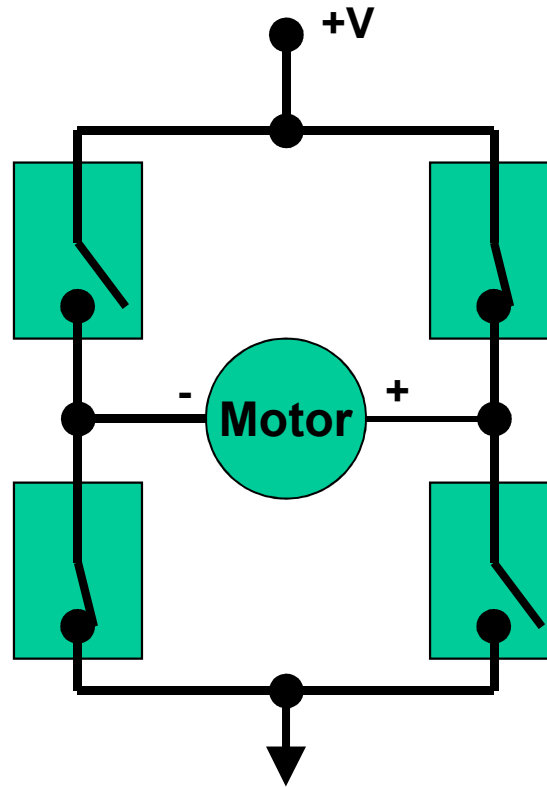


Frequency: 25 kHz



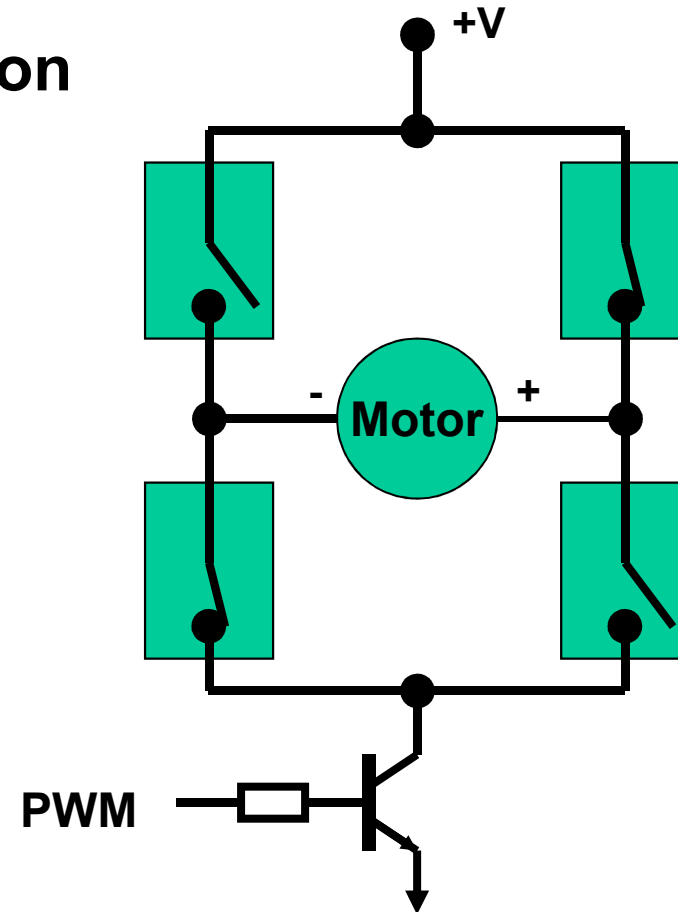
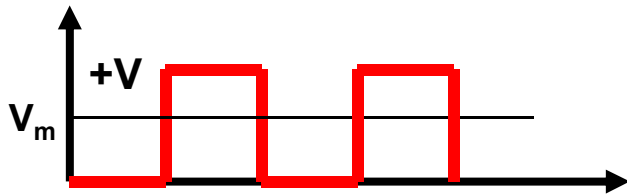
Motor Control: Direction

H-Bridge

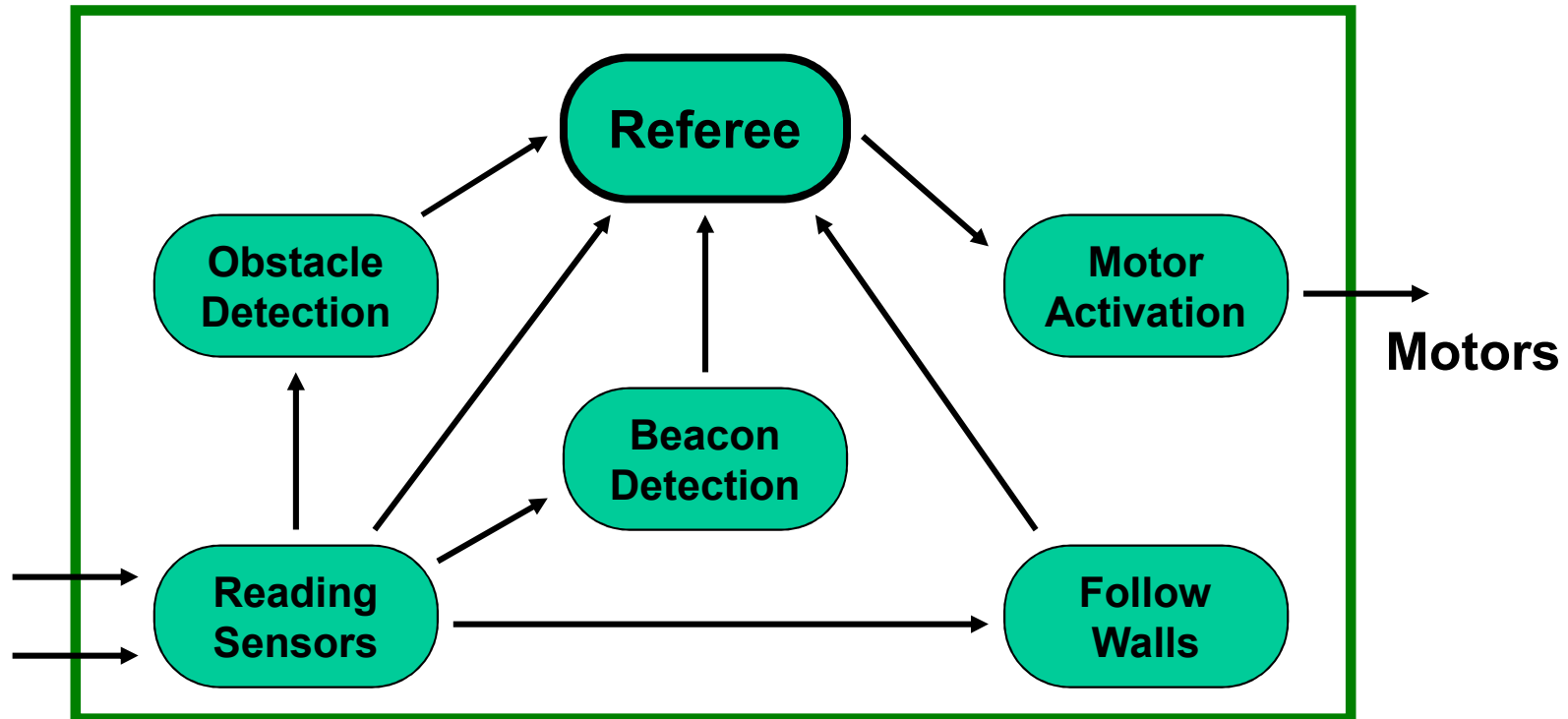


Motor Control: Velocity

Pulse Width Modulation



Software

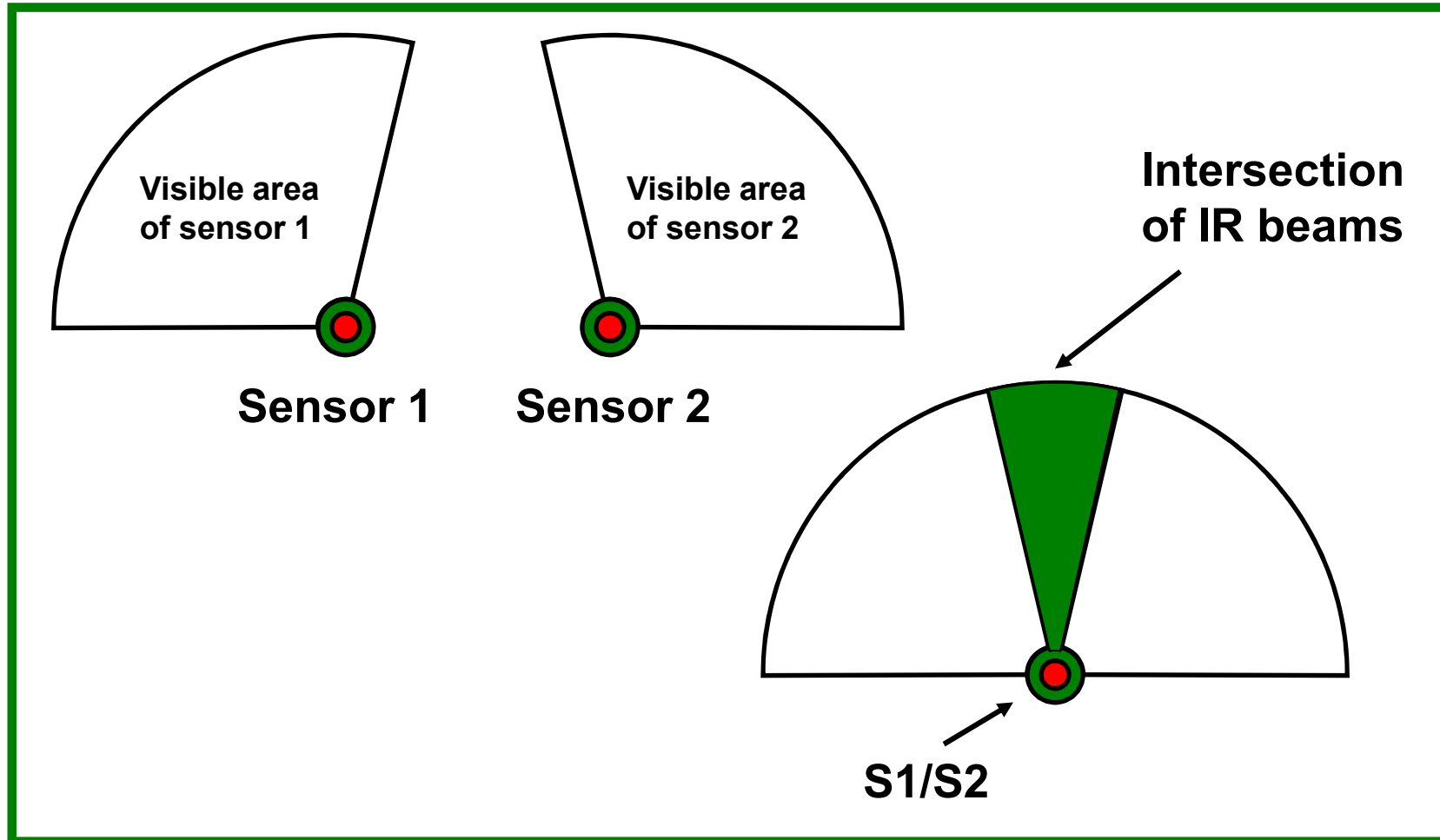


Software

```
while (1) {  
    Read_Sensors  
    Verify_Arrival  
    Determine_Beacon_Position  
    Follow_Walls  
    Avoid_Obstacles  
    Referee  
    Activate_Motors  
}
```



Infrared Sensor (Double Detection)



Infrared Sensor (Continued Rotation)

