



# TKC225 - Robotika

## PROGRAM STUDI SISTEM KOMPUTER

### UNIVERSITAS DIPONEGORO

# Sistem Robot (Beroda)



# Pokok Bahasan Kuliah

- Pembahasan tentang robot beroda / WMR (Wheeled Mobile Robot)
  - Aplikasi
  - Isu pengembangan WMR: steering, komponen, kontrol (low-level) dan kontrol high-level
  - Navigasi: dinding, garis dan tepi
- Pembahasan sensor untuk WMR
- Acknowledgement: sebagai presentasi diambil dari slide pak Iwan Setiawan

# Aplikasi Robot: Eksplorasi



**NOMAD**



**Mars Rover**

<http://www.frc.ri.cmu.edu/projects/meteorobot/Nomad/Nomad.html>

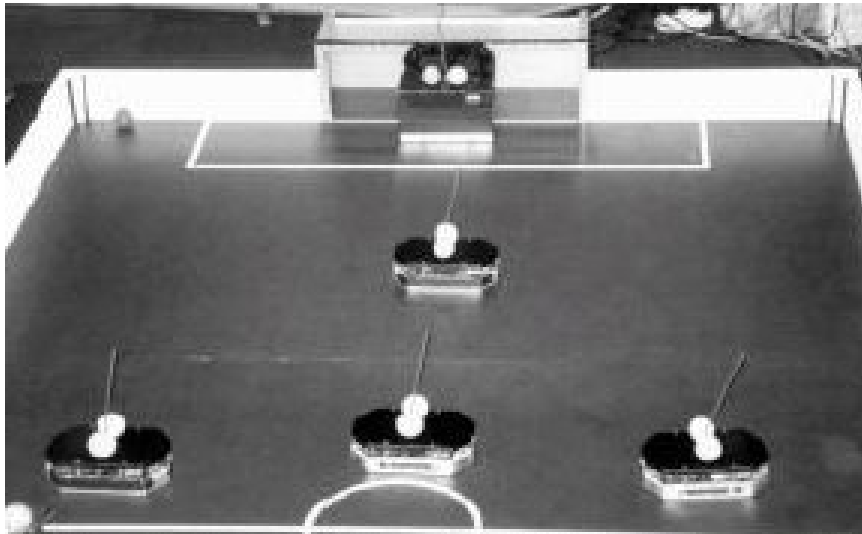
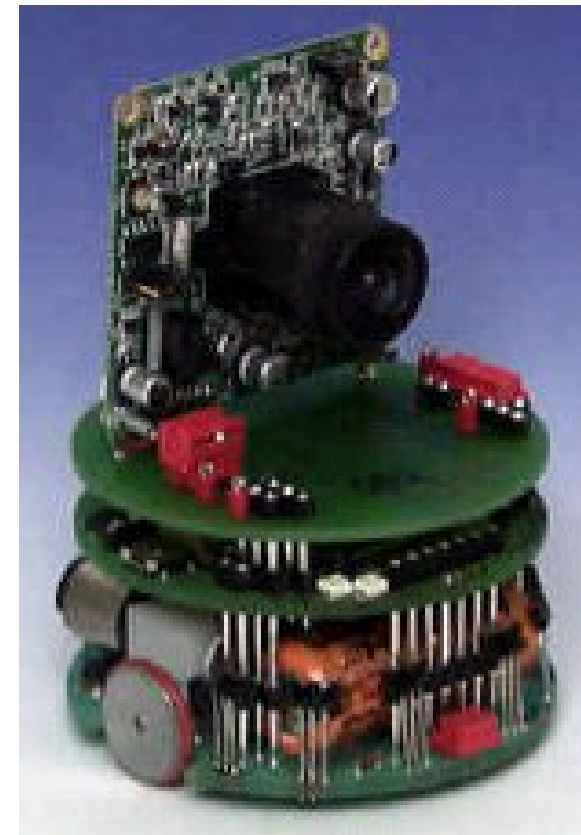
[http://en.wikipedia.org/wiki/Mars\\_Exploration\\_Rover](http://en.wikipedia.org/wiki/Mars_Exploration_Rover)

# Aplikasi Robot: Pelayan & Asisten





# Aplikasi Robot: Edukasi, Hiburan





# Pengembangan Robot Berjalan

- Steering of WMR (Wheeled Mobile Robot)
- Components of WMR
- Navigation
- Control (Low Level)
- Control Architecture (High Level)

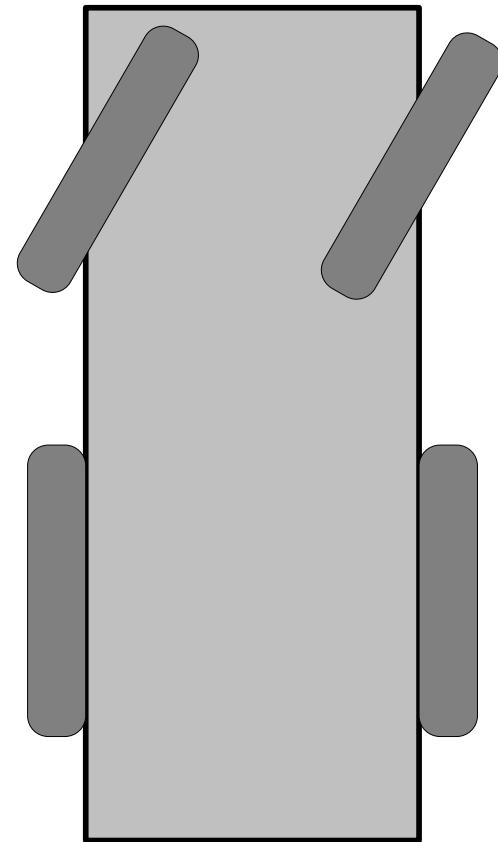


# Tipe Pengendalian: Ackerman

- Known as Car-Like Steering

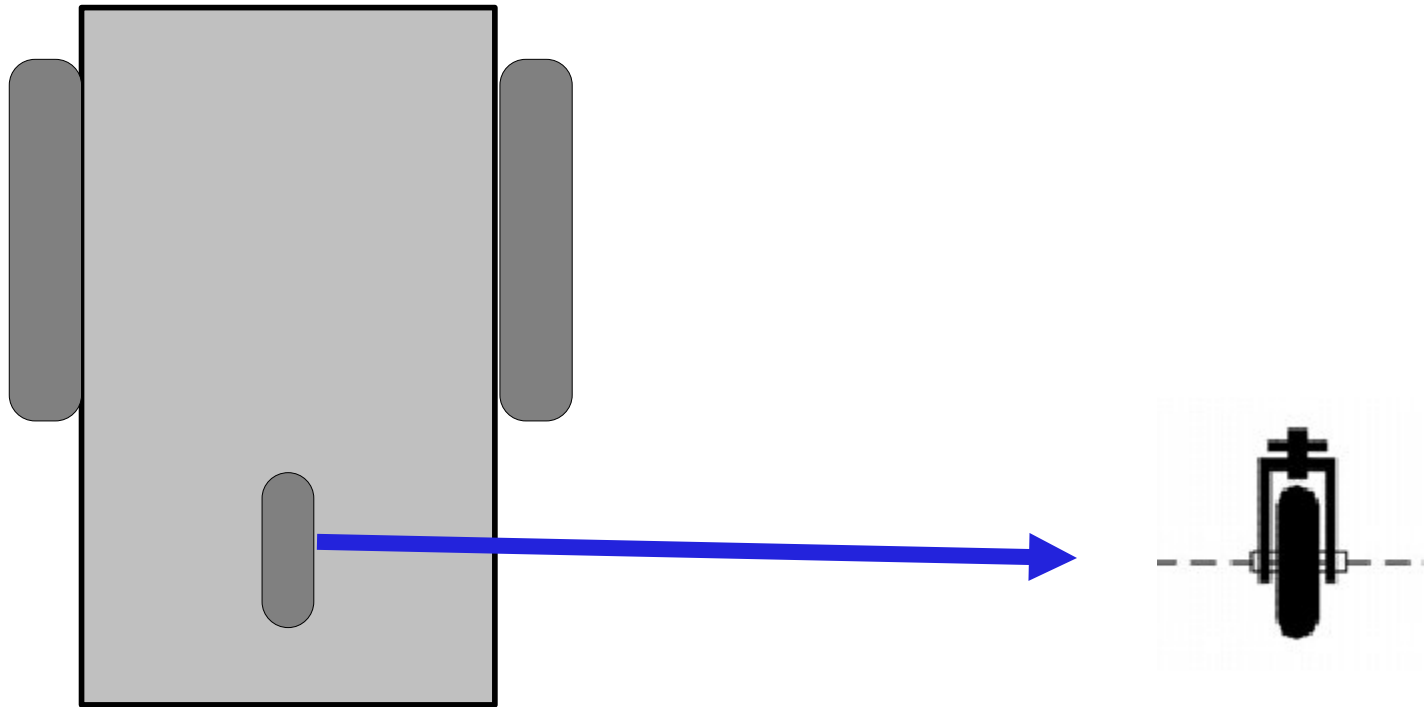
forward velocity of the rear wheels

angular velocity of the steering wheels





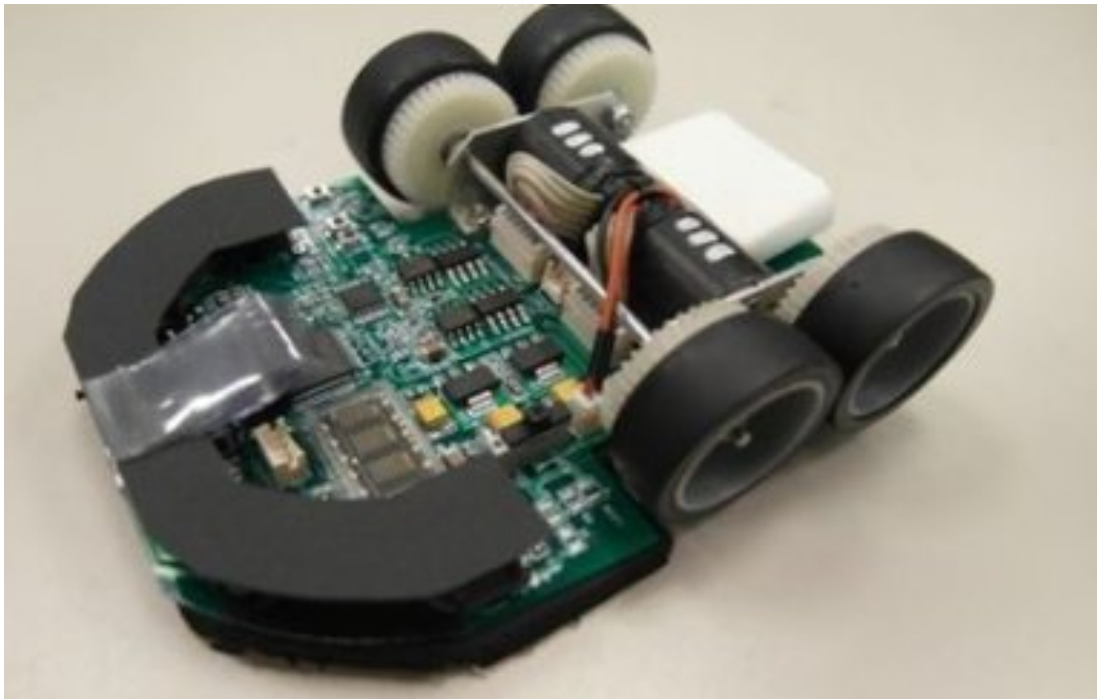
# Tipe Pengendalian: Diferensial



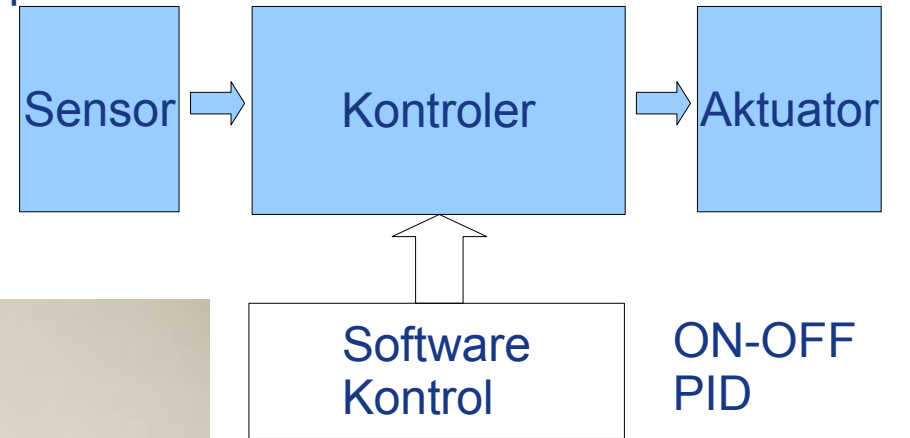


# Komponen Robot

- Sensor
- Kontroler
- Aktuator

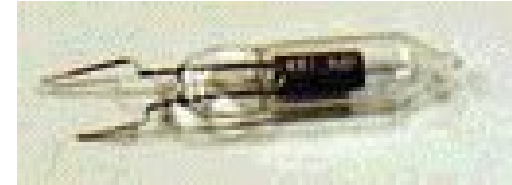
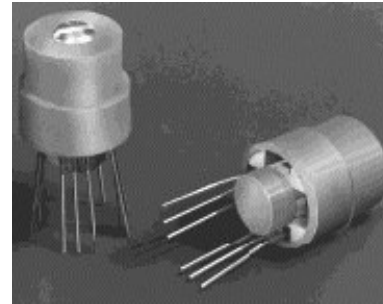
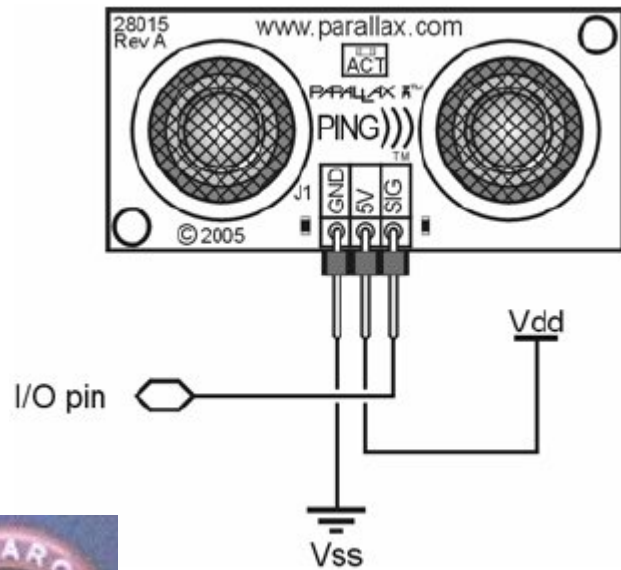


Ping, IR,  
phototransistor



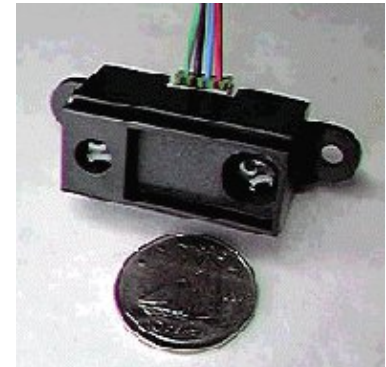
## SENSOR

UltraSound



UV Sensor

Compass



IR sensor



Gas Sensor



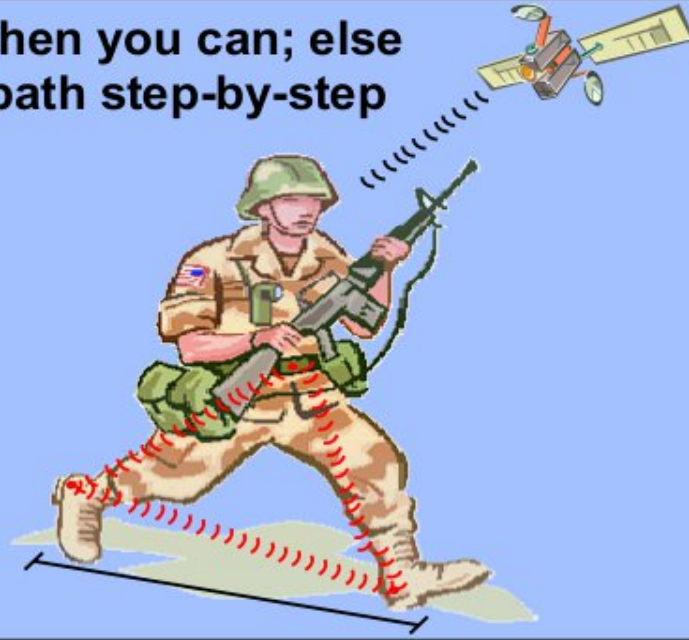
Metal Detector



Touch Sensor

# Tracking: Dead Reckoning

Use GPS when you can; else measure path step-by-step



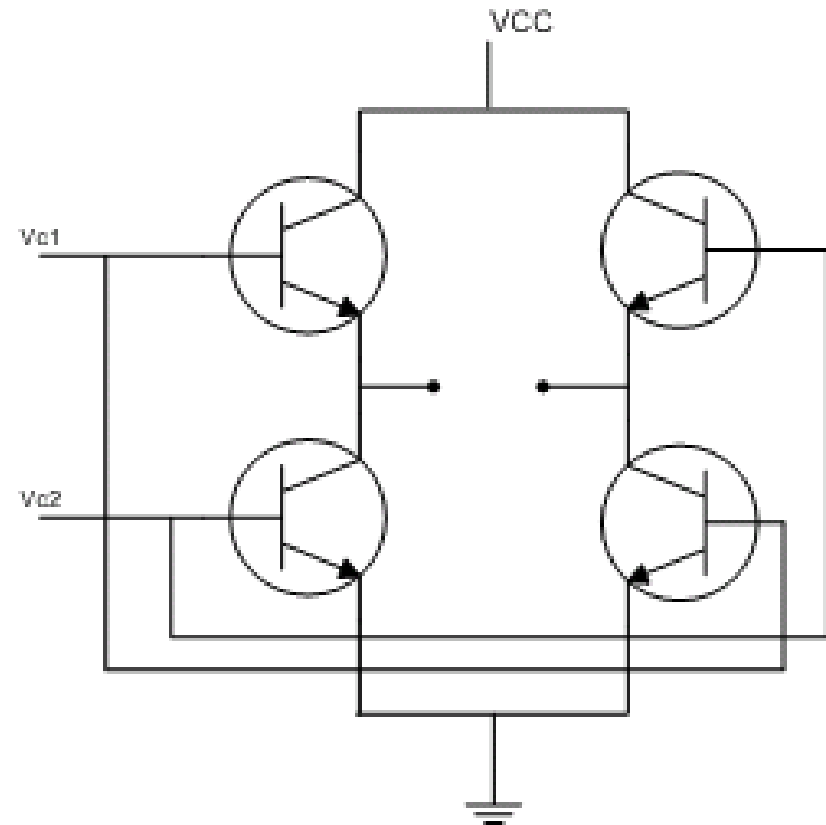
## Ultrasonic Inter-Foot Sensing

relative position and orientation of feet in 2D/3D by ultrasonic ranging among multiple transducers



## AKTUATOR

- Wheels
- Gear DC Motor
- Driver : H- Bridge





# Navigasi

## Navigation is essential component for mobile robot

What is Navigation ?

- Process of determining and maintaining a course or trajectory from one place to another



# Navigasi

- Pengikut Dinding
  - <http://www.youtube.com/watch?v=uPyd8m3QkN0>
- Pengikut Garis
  - <http://www.youtube.com/watch?v=jqM2qm4DHU4>
- Pengikut Tepi
  - [http://www.youtube.com/watch?v=TR0eMI\\_B1oE](http://www.youtube.com/watch?v=TR0eMI_B1oE)



# Tugas Mahasiswa

- Rancang sistem sensor (sensor dan prinsip kerjanya) untuk quad-rotor
  - Quad-rotor dapat diluncurkan dari dalam gedung (base)
  - Mampu menghindari dinding dan objek lain di dalam gedung
  - Mampu mengikuti waypoint ke titik akhir (alamat GPS) yang telah diset di luar gedung
  - Mampu menghindari object di luar gedung
  - Mampu kembali ke base
- Pembagian Kelompok Robot Berjalan