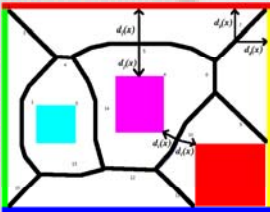
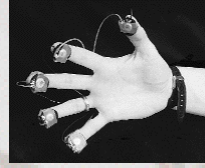


ROBOTIK SENSORLER

Dr. Ahmet ÖZKURT
DEUEEE

ROBOT TASARIM ADIMLARI

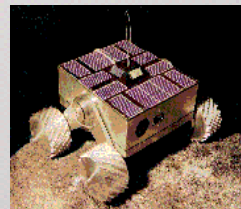
ALGILAMA



PLANLAMA

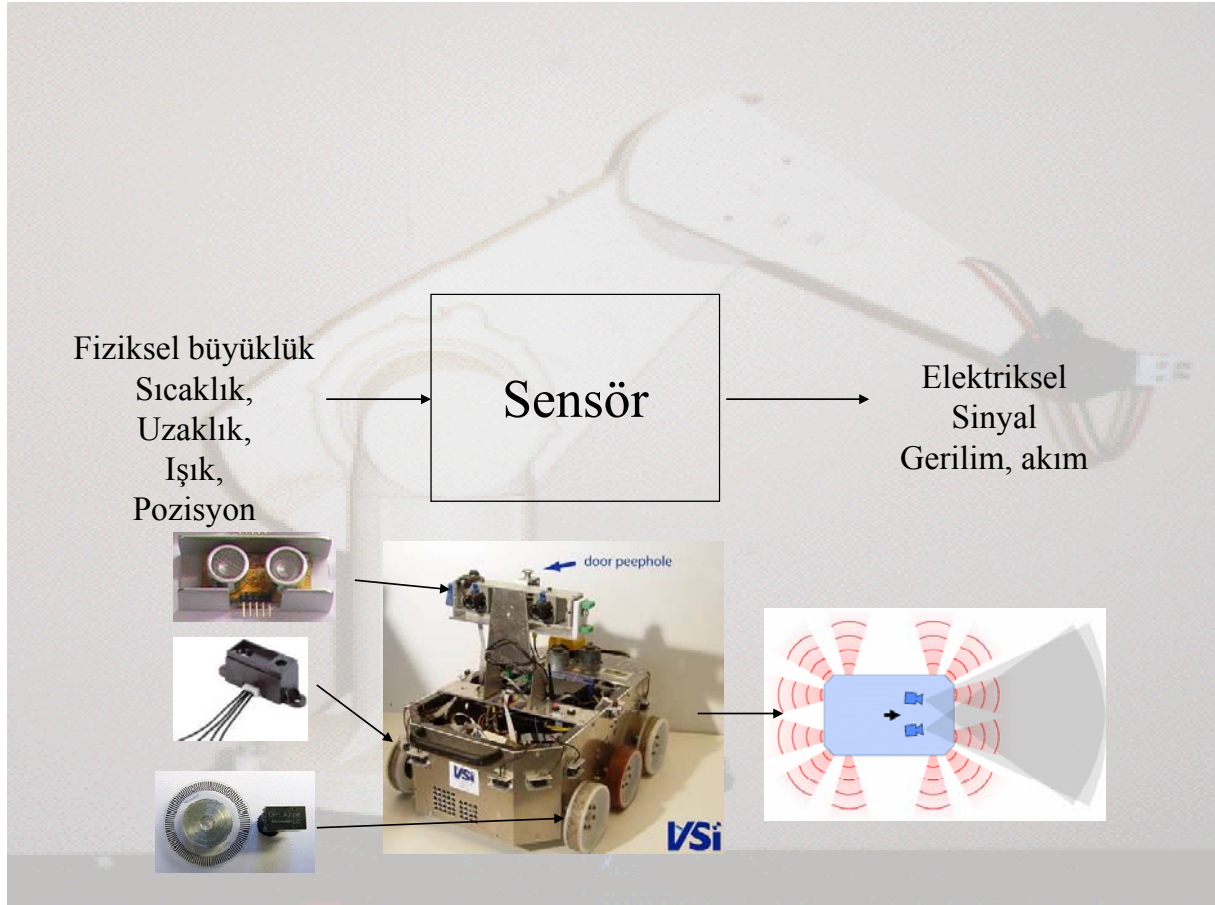


HAREKET



Sensor nedir?

- Çevrenin ve çevresel deęişkenlerin durumunu algılayan elemanlardır.
- Temelde herhangi bir fiziksel büyüklüęü elektriksel sinyallere çevirmek için kullanılırlar.



Sensörlerin Sınıflandırılması

- Uyartım-Fiziksel Büyüklük
- Çalışma prensibi
- Karakteristik özellikler
- Uygulama alanı

Uyartım-Fiziksel Büyüklük

- Elektrik: Akım, Gerilim, Direnç
- Manyetik: Manyetik alan, indüksiyon
- Optik: Işık, renk
- Kimyasal: koku,
- Radyasyon: Foton, Rf güç
- Sıcaklık
- Mekanik: Titreşim, Kalınlık, sertlik

Ölçüm ve Ölçüm Hataları

- Ölçüm Hatası
 - Sistematik Hata
 - Random Error
- Hassasiyet (Precision) Küçük deęişim
- Doğruluk (Accuracy): Küçük hata

Sensör Parametreleri

- Duyarlılık (Sensitivity)
- Hasssiyet (Resolution)
- Lineerlik (Linearity)
- Kayma (Drift)
- Histerisis (Hysteresis)
- Tekrarlanabilirlik (Precision)
- Dinamik durum

Model No Type	TC-10 Temperature Sensor Thermocouple K
Input signal	Temperature
Range of operation	-200°C to 1200°C
Output signal	4-20 mA or 0-10V
Accuracy	±0.2% of span
Repeatability	±0.1%
Speed of response	fast
Size	Probe lengths: 10 cm-1m Body: 12 cm dia.×7 cm
Mounting	On tank wall
Environment	-40°C to 100°C
Power requirements	12-35V DC
Guarantee	90 days
Typical application	Chemical

Robot Sensörleri

- Manipulatörler- Kollu Robotlar

Hız, tork, Kuvvet, açı

- Mobil Robotlar

Uzaklık, engel belirleme, konum, eğim,
güç seviyesi, akım, hız

Bazı Sensor tipleri

- Ladar (laser distance and ranging)
 - Time of flight
 - Phase shift
- Sonar
- Radar
- Infra-red
- Işık
- Sıcaklık
- Dokunma
- Rezistiv

Bir Sensorü nasıl seçersiniz?

- 1) Maliyet
- 2) Çevresel etmenler ve değişkenler
- 3) Çalışma bandı
- 4) Bakış açısı



Resistive Sensors

Bend Sensors

- Resistance = 10k to 35k
- Force to produce 90deg = 5 grams
- www.jameco.com = 10\$



Resistive Bend Sensor

Potentiometers

- Fixed Rotation Sensors
- Easy to find, easy to mount



Potentiometer

Light Sensor

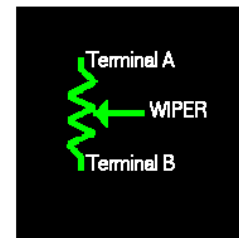
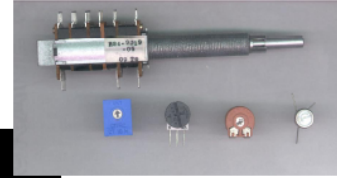
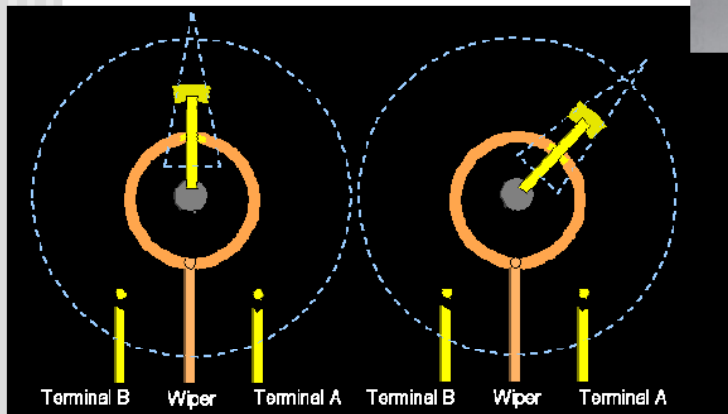
- Good for detecting direction/presence of light
- Non-linear resistance
- Slow response



Cadmium Sulfide Cell

Potentiometers

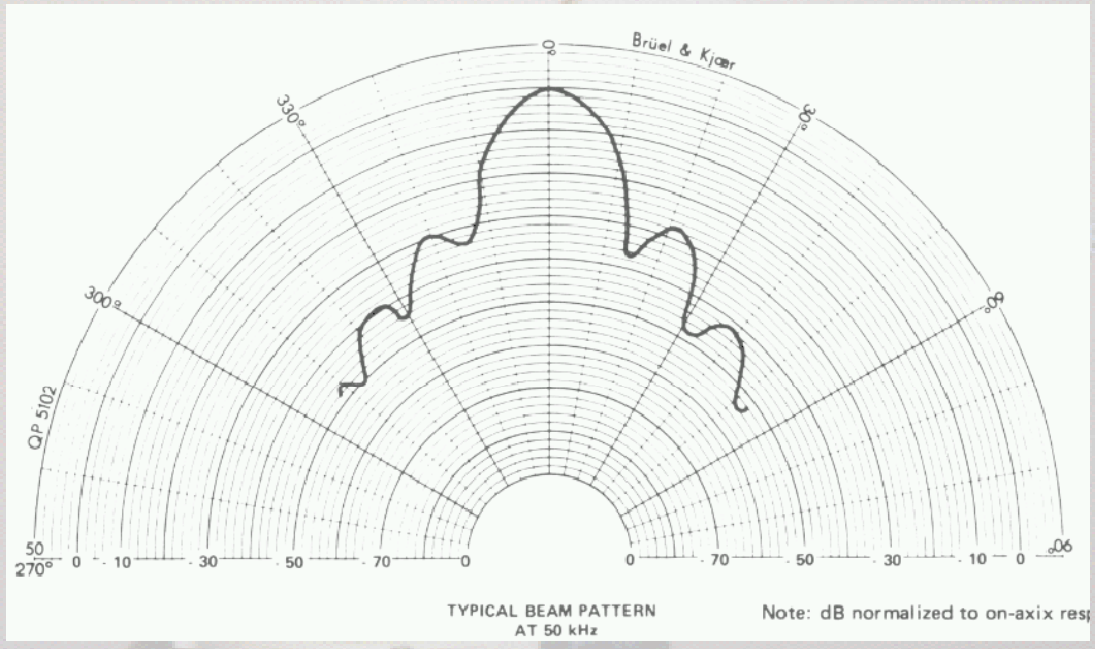
- Produce a voltage proportional to shaft position
- Voltage divider



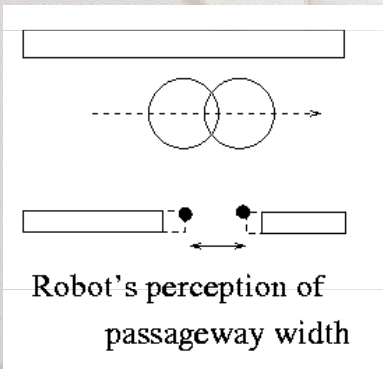
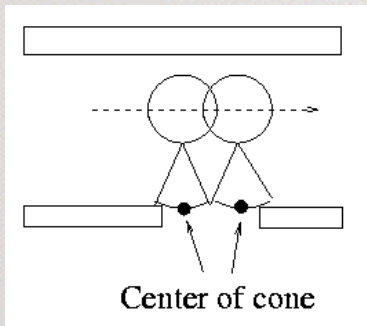
Babin Perry

Potentiometers

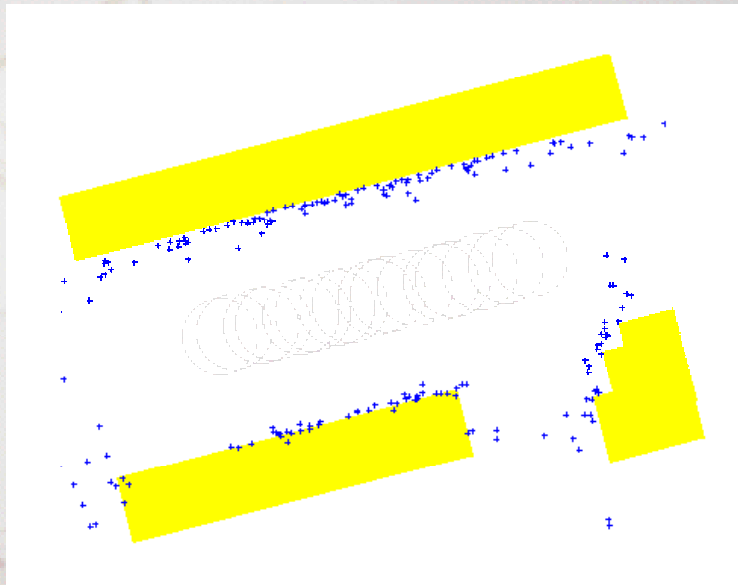
- Problems:
 - Friction (for backdriveable systems like haptic devices)
 - Noise
 - Resolution
 - Linearity



Not Gaussian!!

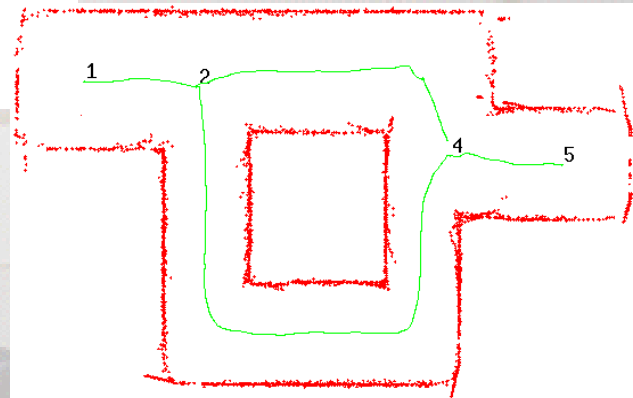
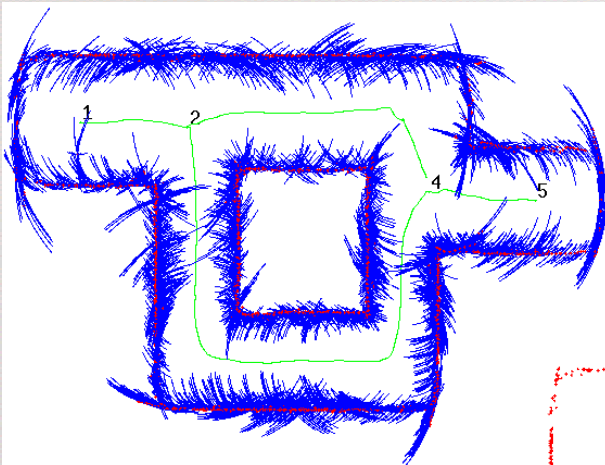
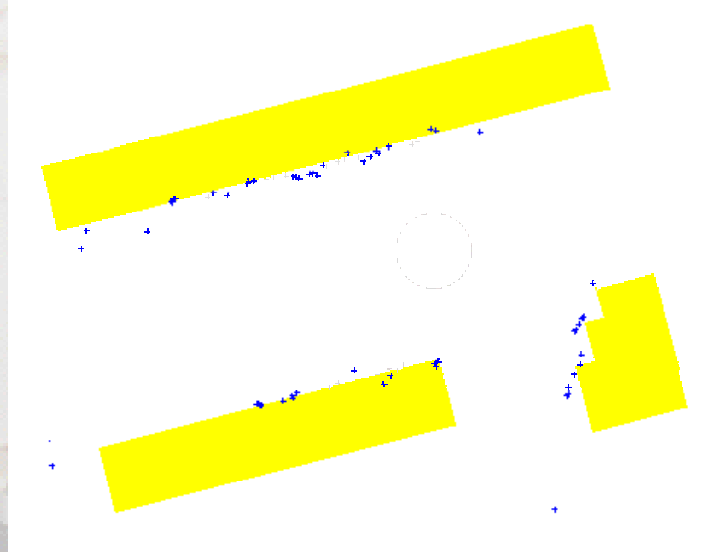
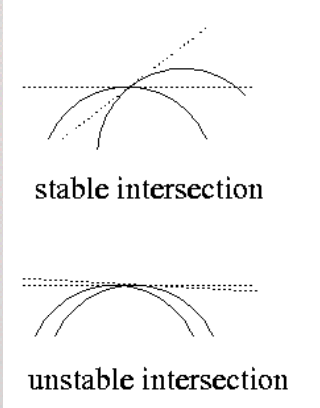
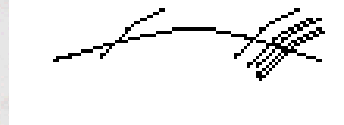


Problem with Naïve Model

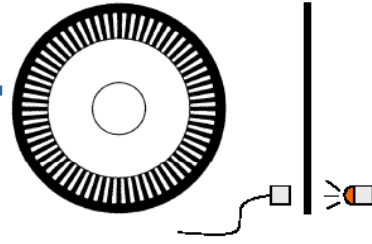


Arc Transversal Method

- Uniform Distribution on Arc
- Consider Transversal Intersections
- Take the Median



Optical Encoders



- How do they work?
 - A focused beam of light aimed at a matched photodetector is interrupted periodically by a coded pattern on a disk
 - Produces a number of pulses per revolution (Lots of pulses = high cost)
- Quantization problems at low speeds
- Absolute vs. referential