



# Geleceğin Fabrikalarında Yapay Zeka ve Robotik Sistemler

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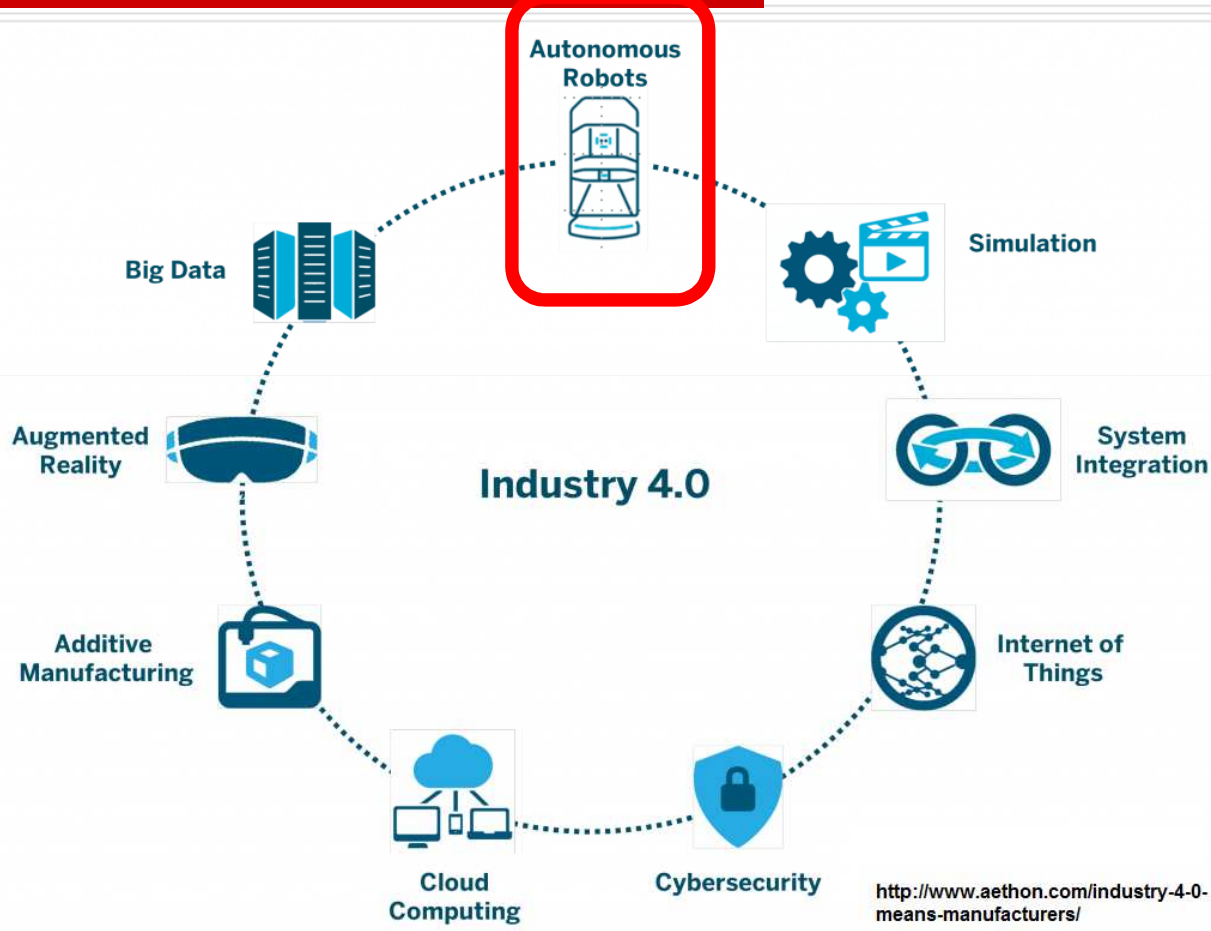


# Sunum İeriđi

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- Endüstri 4.0 Bileşenleri
- Yapay Zeka ve Robotik:  
Otonom(Autonomous) Robotlar
- Robotik Sistemler Uygulama Alanları
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  - Otonom Araçların Geçmişı
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- Fabrika Seviyesi Otonomluk
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# Endüstri 4.0 Bileşenleri

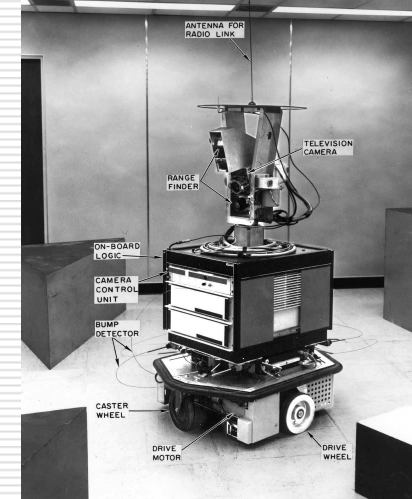


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# Yapay Zeka ve Robotik: Otonom(Autonomous) Robotlar

- ❑ **1920, Robot** (Karel Capek'in Rossum's Universal Robots Play): Czech word "robota" means simply work.
- ❑ **1956, Artificial Intelligence** (John McCarthy): the science and engineering of making intelligent machines
- ❑ **1966, SHAKEY**: The first mobile robot with the ability to perceive and reason about its surroundings.
- ❑ **1980, 3rd generation Robot** : Gathers information about its environment (**senses**) and uses that information (**plan**) and behave correspondingly (**acts**).



SHAKY

**OTONOM  
ROBOT**

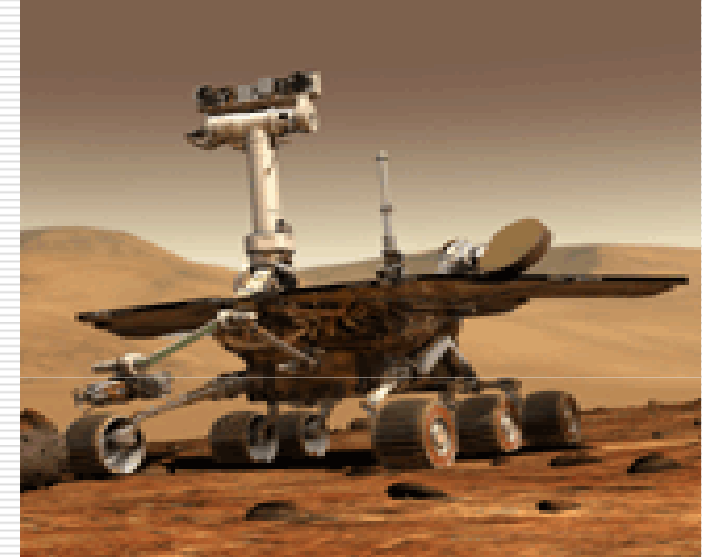
# Robotik Uygulamalar



**Agriculture:** A fully autonomous harvester using vision perception to completely harvest a field with no human supervision.



Cooperative Drive



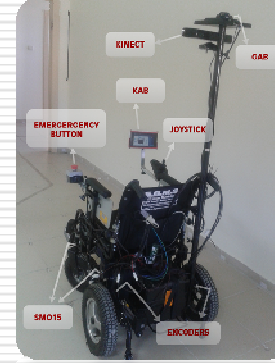
**Space:** Mars Exploration Rovers

**The fact!:** Even at the speed of light, about 186,000 miles per second, radio messages take at least 11 minutes to reach Mars

# Bazı Yerli Robotik Platformlar.. Ülkemizden ve Eskişehir'den



**Unmanned Aerial Vehicle(UAV ):**  
ANKA, Bayraktar



**Intelligent Wheelchair (ATEKS)**



**Humanoid Robot**  
(Akinci, Akinsoft)



**Animatronik Yüz**



**Autonomous Ground Vehicle (İzci, Aselsan)**



**EvaRobot**  
A platform for  
Autonomous  
Research and  
Education (**ROS**  
compatible)

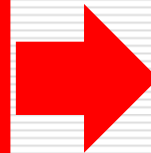
# EU Robotik Yol haritası (2013) 2014-2020



## □ Robotik Ana Çalışma Alanı(ICT vb)

## □ Uygulama Alt Alanları

- Healthcare
- Agriculture
- Civil
- Commercial
- Consumer
- Logistics and Transport
- Manufacturing



**Factories of the Future  
(FoF)+  
Automate from warehouse  
to door: Endüstri 4.0**

# Ulaştırma ve Lojistik’de Otonom Robotlar

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## □ Transportation of

- People
- Goods



## □ Logistics and Warehousing

## **OTONOM ROBOT Studies:** **STATE OF THE ART:**



\*Autonomous/ Intelligent Vehicle??

\*AGV, TGV  Autonomous AGV...



# Otonom Arabaların geçmişi: Vizyon'dan emeklemeye (1982-2000)

- **Başlangıç ?**  
**1982: Knight-Rider**  
**(Kara Şimşek)**
- **1994:CMU NavLab:**  
Pittsburgh to San Diego
  - 2897 miles total
  - 2849 autonomously
- **1997: Demo'97: San Diego,**  
**I-15 Hihgh-way**



# Otonom Arabaların gemiři:

## öl Yarıřları; 2004, 2005 (Mojave Desert)

Environment: **Perception!! (Power of AI)**



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# Otonom Arabaların geçmişi: Çöl Yarışları; 2004, 2005 (Mojave Desert)

## Vehicles



OSU: Terramax



Team CIMAR



OSU: ION



Stanford

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# Otonom Arabaların geçmişi: 2007 Şehir içi araba yarışı: OSU-ACT Autonomous Car

- ❑ The Ohio State University-The Autonomous City Transport
- ❑ **The Key Technologies**
  - ❑ Drive-by-wire technology(Steering motor added)
  - ❑ Stable instrument platform
  - ❑ GPS, maps and various sensors
  - ❑ **Computers**
  - ❑ **Software**
  - ❑ **Algorithms (Yapay Zeka)**

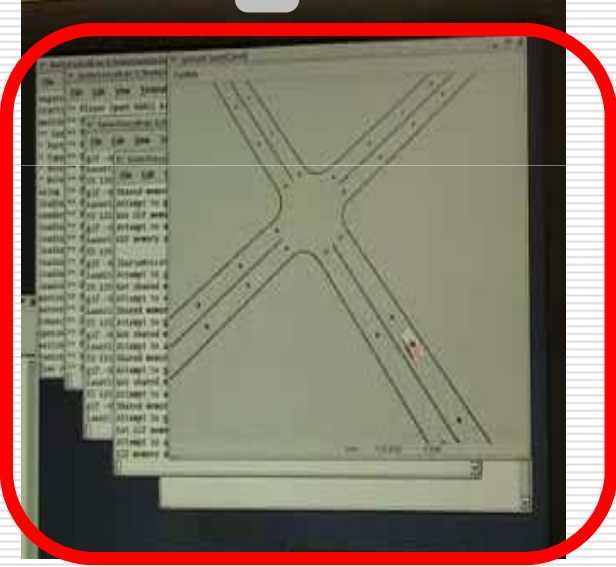
## Hibrid Toyota Highlander



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# Otonom Arabaların geçmişi: Geliştirme adımları



Simulation Environment:  
GAZEBO



Laboratory Tests:  
P3-AT Gezgin Robot



Vehicle Tests

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# Otonom Arabaların geçmişi:

## 2012, Mayıs: Otonom Araba ya ilk ehliyet



### Google Robotic CAR

- Nevada eyaleti kendi kendine giden arabaya ilk ehliyet verildi
- Lasvegas'ta Kırmızı fon, sonsuz işareti ile araba görürseniz bu kendi başına gidiyor demektir.

OTONOM ARABA 😊  
SIRA??



# Fabrikalarda Robotlar

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For moving material and product:

- Automatic guided vehicle (AGV) (1953).
  - Pallet truck AGVs
  - Counterbalance forked AGVs
  - Unit load AGVs
  - .....



**TODAY, The TREND in the Factory: Autonomous AGV**  
Can estimate its own location, **autonomously** guide itself along a route on an **electronic map** without the use of equipment such that guide wires.....

# Fabrikalarda Robotlar

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- Industrial robot(for manufacturing): automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes.



- **TODAY, The TREND in the Factory:**

Multiple robotic arm working in cooperation





# Fabrikalarda Robotlar

□ AGV+ Robotic Arm



□ **TODAY, The TREND in the Factory:**

Autonomous Mobile robot with Robotic Arm



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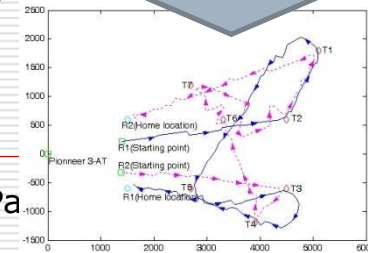


# Fabrika Seviyesi Yapay Zeka ve Otonomluk

- ❑ **Robots** : Learning from other robots and humans, Self -testing and repairing....
- ❑ **Data Analytics**: Improvements, Anomaly Detection...
- ❑ **Maintenance** : Predictive Maintenance  
→ **Prescriptive Maintenance**
- .....
- ❑ **Planning**: Reactive, → **Proactive Planning**
- ❑ **Örnek**: ESOGÜ BAP Projesi 2006 Otonom Robot Görev Planlama ve Gerçekleme



Task no	First Operation		Second Operation		Task location	
	$R_1$	$R_2$ (unit)	$R_1$	$R_2$ (unit)	X(mm)	Y(mm)
1	$R_1$	8	$R_2$	2	5100	1800
2	$R_1$	7	$R_2$	5	4500	600
3	$R_2$	6	$R_1$	4	4500	-600
4	$R_2$	5	$R_1$	3	3900	-1200
5	$R_1$	7	-	-	2700	-600
6	$R_2$	1	-	-	5500	600
7	$R_2$	5	-	-	2700	1200



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# Geleceğin Fabrikaları

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## *Light Out Factories*

- Highly automated/ autonomous robots
- No need for light, food etc.



***AND, the motto for us "Automation from warehouse to door" !!***

## □ Teşekkürler

Sorular

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Yapay Zeka ve Robotik Laboratuvarı



*Looking for something?*

