

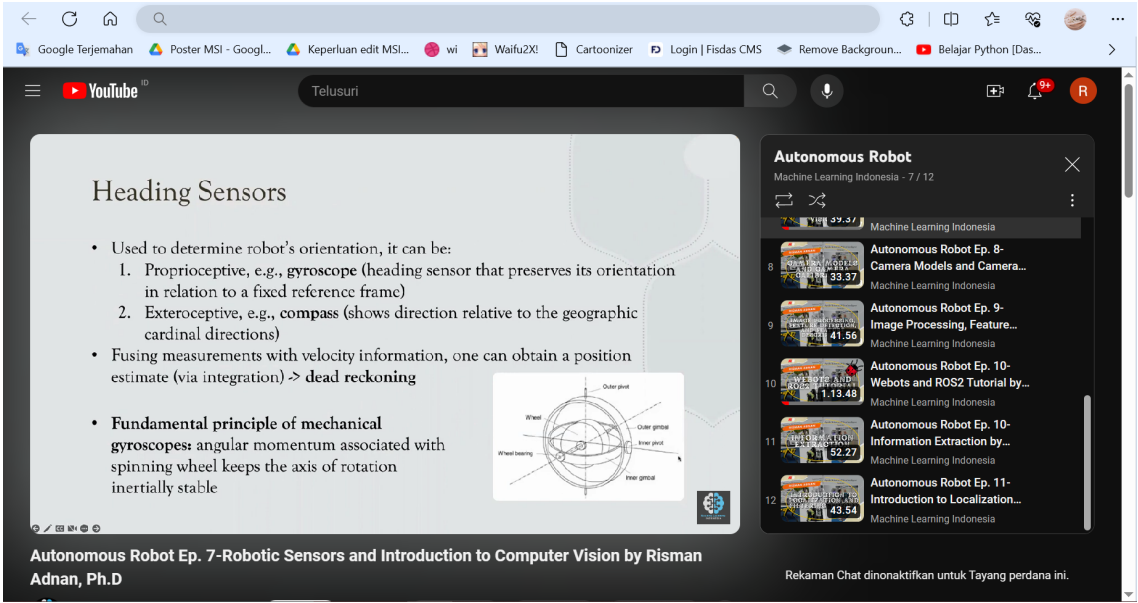
Nama : Ratika Dwi Anggraini

NIM : 1103201250

## TUGAS 11 – ROBOTIKA

### COMPUTER VISION

Dalam pertemuan mata kuliah robotik, dimulai dengan membahas konsep dasar sensor dalam konteks robotika. Sensor dijelaskan sebagai perangkat yang memungkinkan robot mendapatkan informasi dari lingkungannya, seperti kamera, Xbox 360, pelodine, dan berbagai sensor lainnya. Pentingnya sensing dalam robotika juga disoroti sebagai kemampuan robot untuk mendapatkan informasi dari lingkungan fisiknya.



The screenshot shows a YouTube video player with the title "Heading Sensors". The video content includes the following text:

- Used to determine robot's orientation, it can be:
  1. Proprioceptive, e.g., **gyroscope** (heading sensor that preserves its orientation in relation to a fixed reference frame)
  2. Exteroceptive, e.g., **compass** (shows direction relative to the geographic cardinal directions)
- Fusing measurements with velocity information, one can obtain a position estimate (via integration)  $\Rightarrow$  **dead reckoning**
- Fundamental principle of mechanical gyroscopes:** angular momentum associated with spinning wheel keeps the axis of rotation inertially stable

A diagram of a robot's internal sensor system is shown, labeled with "Wheel", "Wheel bearing", "Outer gyro", "Inner gyro", and "Outer gyro".

The video is part of the "Autonomous Robot" series by Machine Learning Indonesia. The video title is "Autonomous Robot Ep. 7-Robotic Sensors and Introduction to Computer Vision by Risman Adnan, Ph.D".


The video player interface shows the YouTube logo, a search bar, and a list of related videos on the right side. The list includes:

- Autonomous Robot Ep. 8- Camera Models and Camera...
- Autonomous Robot Ep. 9- Image Processing, Feature...
- Autonomous Robot Ep. 10- Webots and ROS2 Tutorial by...
- Autonomous Robot Ep. 10- Information Extraction by...
- Autonomous Robot Ep. 11- Introduction to Localization...

Computer Vision adalah subdisiplin dalam bidang kecerdasan buatan yang fokus pada pengembangan sistem komputer yang mampu memahami dan menginterpretasikan informasi visual dari dunia nyata. Tujuan utamanya adalah membuat komputer memiliki kemampuan untuk melihat dan memahami gambar atau video seperti manusia. Untuk mencapai tujuan ini, Computer Vision menggunakan teknik-teknik pengolahan citra, analisis pola, dan machine learning untuk mengenali objek, menganalisis struktur dan konten visual, serta membuat keputusan berdasarkan data visual yang diterimanya.

**Vision**

- Vision: ability to interpret the surrounding environment using light in the visible spectrum reflected by objects in the environment
- Human eye: provides enormous amount of information, ~ millions of bits per second
- Cameras (e.g., CCD, CMOS): capture light -> convert to digital image -> process to get relevant information (from geometric to semantic)



1. Information extraction  
2. Interpretation

Autonomous Robot Ep. 7-Robotic Sensors and Introduction to Computer Vision by Risman Adnan, Ph.D

Rekaman Chat dinonaktifkan untuk Tayang perdana ini.

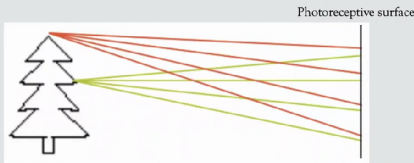
**Autonomous Robot**  
Machine Learning Indonesia - 7 / 12

- Autonomous Robot Ep. 8- Camera Models and Camera...
- Autonomous Robot Ep. 9- Image Processing, Feature...
- Autonomous Robot Ep. 10- Webots and ROS2 Tutorial by...
- Autonomous Robot Ep. 10- Information Extraction by...
- Autonomous Robot Ep. 11- Introduction to Localization...

Beberapa aplikasi Computer Vision melibatkan pengenalan wajah, deteksi objek, pelacakan gerakan, segmentasi citra, pengenalan tanda tangan, serta pemahaman konten visual untuk mendukung pengambilan keputusan. Dengan kemajuan teknologi, Computer Vision semakin banyak digunakan dalam berbagai industri, termasuk otomotif (self-driving cars), keamanan, kesehatan, industri manufaktur, dan lainnya. Teknologi ini memberikan dampak besar dalam memahami dan memanfaatkan data visual untuk meningkatkan efisiensi dan kecerdasan sistem komputer.

**How to capture an image of the world?**

- Light is reflected by the object and scattered in all directions
- If we simply add a photoreceptive surface, the captured image will be extremely blurred



Photoreceptive surface

Autonomous Robot Ep. 7-Robotic Sensors and Introduction to Computer Vision by Risman Adnan, Ph.D

Rekaman Chat dinonaktifkan untuk Tayang perdana ini.

**Autonomous Robot**  
Machine Learning Indonesia - 7 / 12

- Autonomous Robot Ep. 8- Camera Models and Camera...
- Autonomous Robot Ep. 9- Image Processing, Feature...
- Autonomous Robot Ep. 10- Webots and ROS2 Tutorial by...
- Autonomous Robot Ep. 10- Information Extraction by...
- Autonomous Robot Ep. 11- Introduction to Localization...

Poin berikutnya adalah penggunaan simulator sebagai pengganti robot fisik untuk pembelajaran, dengan contoh simulator seperti Carla, Unity, Nvidia Drive, dan Roblox. Mahasiswa diarahkan untuk fokus pada mobile robot, terutama terkait dengan karakteristik performa sensor. Selanjutnya, diberikan contoh sensor yang umum digunakan, seperti reseptif, pasif, aktif, dan lainnya, serta

membahas klasifikasi dan desain sensor berdasarkan parameter teknis seperti dynamic range, resolution, linearity, dan bandwidth.

The screenshot shows a YouTube video player with the title "Autonomous Robot Ep. 7-Robotic Sensors and Introduction to Computer Vision by Risman Adnan, Ph.D". The video content displays the CARLA website, which is an open-source simulator for autonomous driving research. The website features a navigation menu, a search bar, and a list of latest news. The CARLA logo is prominently displayed at the top of the website content.

**Autonomous Robot**  
Machine Learning Indonesia - 7 / 12

**Introduction**  
CARLA has been developed from the ground up to support development, training and validation of autonomous driving systems. In addition to open-source code and protocols, CARLA provides open digital assets (urban layouts, buildings, vehicles) that were created for this purpose and can be used freely. The simulation platform supports flexible specification of sensor suites, environmental conditions, full control of all static and dynamic actors, maps generation and much more.

**Latest News**  
NVIDIA Joins CARLA Consortium  
CARLA 0.9.13 Release  
CARLA 0.9.12 Release  
CARLA 0.9.11 Release  
CARLA 0.9.10 Release

**Video**  
CARLA 0.9.13

**Get In Touch**  
Twitter Facebook YouTube Email

**Autonomous Robot Ep. 7-Robotic Sensors and Introduction to Computer Vision by Risman Adnan, Ph.D**

Rekaman Chat dinonaktifkan untuk Tayang perdana ini.

The screenshot shows a YouTube video player with the title "Autonomous Robot Ep. 7-Robotic Sensors and Introduction to Computer Vision by Risman Adnan, Ph.D". The video content displays a slide titled "Geometric Active Ranging". The slide contains a list of bullet points and a diagram illustrating the principle of geometric ranging.

**Geometric Active Ranging**

- Fundamental principle: use geometric properties in the measurements to establish distance readings
- The sensor projects a known light pattern (e.g., point, line, or texture); the reflection is captured by a receiver and, together with known geometric values, range is estimated via triangulation
- Examples:
  - Optical triangulation (1D sensor)
  - Structured light (2D and 3D sensor)

**Autonomous Robot**  
Machine Learning Indonesia - 7 / 12

**Autonomous Robot Ep. 7-Robotic Sensors and Introduction to Computer Vision by Risman Adnan, Ph.D**

Rekaman Chat dinonaktifkan untuk Tayang perdana ini.