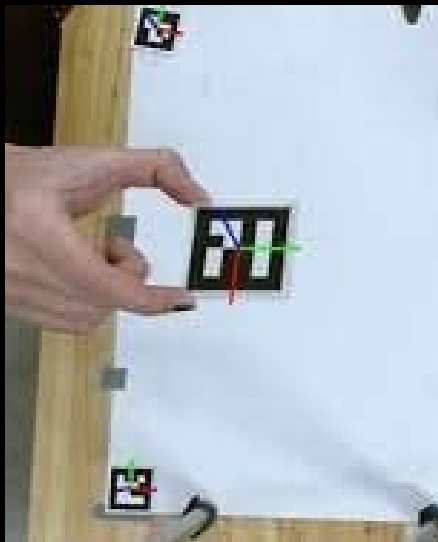


# Introduction to ArUco Markers

Joshua

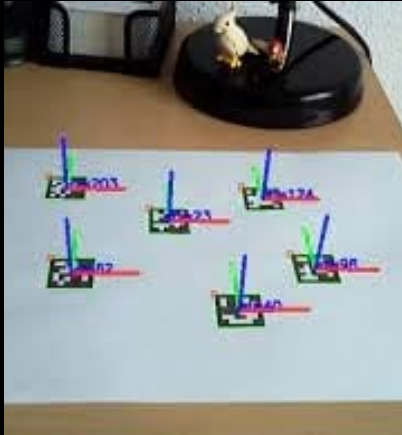
CV and Drones 101



## What Are Aruco Markers?

- **Definition:** ArUco markers are visual markers that serve as a type of code for computer vision systems.
- **Identification:** They are designed to be easily detected and identified by cameras and other imaging devices.
- **Patterns:** ArUco markers consist of distinctive patterns of black squares on a white background, arranged in a specific way.
- **Applications:** These markers are widely used in augmented reality, robotics, and computer vision applications to help machines understand and track the position of objects.
- **Pose Estimation:** ArUco markers enable precise pose estimation, allowing a system to determine the marker's position and orientation in a 3D space.

# How Are They Detected?



- **Contrast and Pattern Recognition:** Detection relies on the high contrast between black squares and the white background, making the marker's pattern easily recognizable.

**Corner Detection and Image Processing(\*):** Algorithms focus on detecting the distinctive corners of black squares, utilizing image processing techniques for efficient marker identification.

- **Corner Detection and Image Processing:** Algorithms focus on detecting the distinctive corners of black squares, utilizing image processing techniques for efficient marker identification.
- **Perspective Transformations and Homography:** Consideration of perspective transformations and homography helps determine the marker's position and orientation in the image.
- **OpenCV and Real-Time Processing:** Many implementations use OpenCV and are optimized for real-time applications, allowing quick and reliable detection of ArUco markers, even in dynamic environments

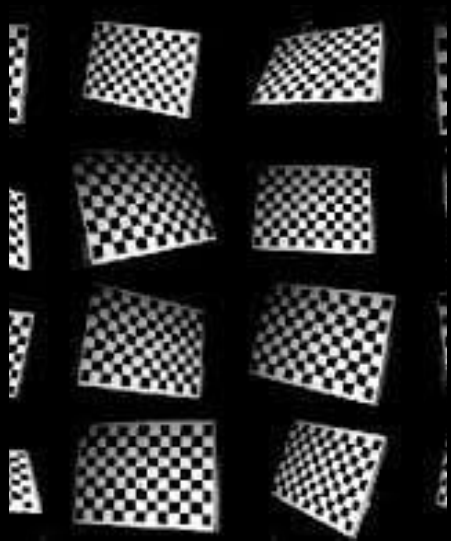
## Why is Camera Calibration needed?

Calibrating the camera corrects lens distortions, ensuring accurate ArUco marker positions.

Calibration enhances pose estimation accuracy, improving the system's ability to determine marker position and orientation.

Intrinsic parameters from calibration optimize feature matching, making it easier to identify and match ArUco marker patterns.

Calibration ensures consistent and reliable measurements, preventing variations in detected marker positions.



# Potential Uses?



nera) Attitude yaw= 19, pitch= 162, roll= 89  
nera) Pos. xm=-145, ym=-15

## Drones, how?