Drones and Autonomous Systems Laboratory

Ball balancing on the beam class 1

-Course Introduction-

DONGBIN KIM –

Ph.D. Candidate

Mechanical Engineering,
University of Nevada, Las Vegas

Course syllabus

Copyright : Dongbin Kim.
E-mail : dongbin.kim@unlv.edu
Drones and Autonomous Systems Lab, UNLV

1. Course Introduction

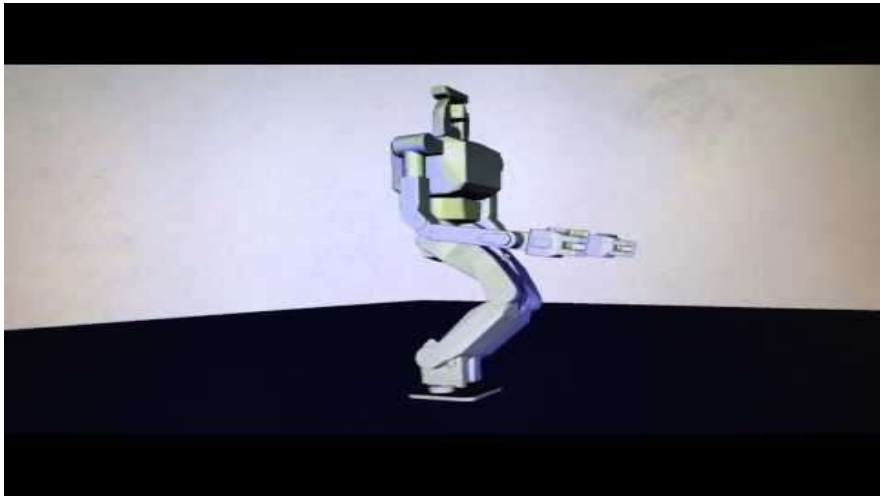
2. Ball and Beam Dynamics

3. OPENCV Practice

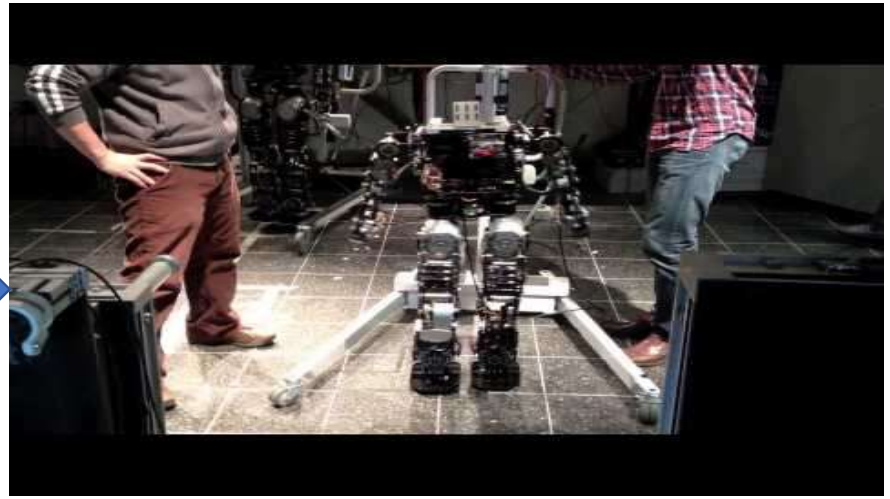
4. ROS Integrated Final Project

1. Introduction – Why?

E-mail : dongbin.kim@unlv.edu
Drones and Autonomous Systems Lab, UNLV



Humanoid Simulation
- Hardware damage loss free.
- Always shows the positive result



Humanoid Real life application
- Gantry is installed for the safety purpose.
- Wrong calibration will fall the humanoid
- This process has more challenges than the simulation

Drones and Autonomous Systems Lab @ UNLV

1. Introduction – Why?

Copyright : Dongbin Kim.
E-mail : dongbin.kim@unlv.edu
Drones and Autonomous Systems Lab, UNLV

Transferring from Simulation to Real life application is DIFFICULT

Humanoid Simulation
- Hardware damage loss free.
- Always shows the positive result

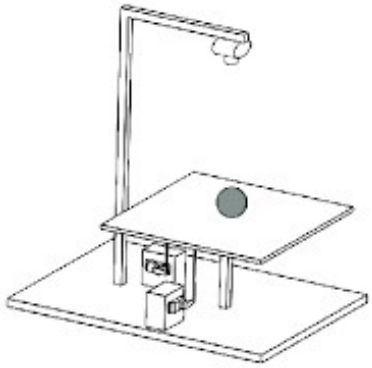
Humanoid Real life application
- Gantry is installed for the safety purpose.
- Wrong calibration will fall the humanoid
- This process has more challenges than the simulation

Drones and Autonomous Systems Lab @ UNLV

1. Introduction – Why Ball and Beam?

Copyright : Dongbin Kim.
E-mail : dongbin.kim@unlv.edu
Drones and Autonomous Systems Lab, UNLV

(1 degree of freedom system)



(2 degree of freedom system)

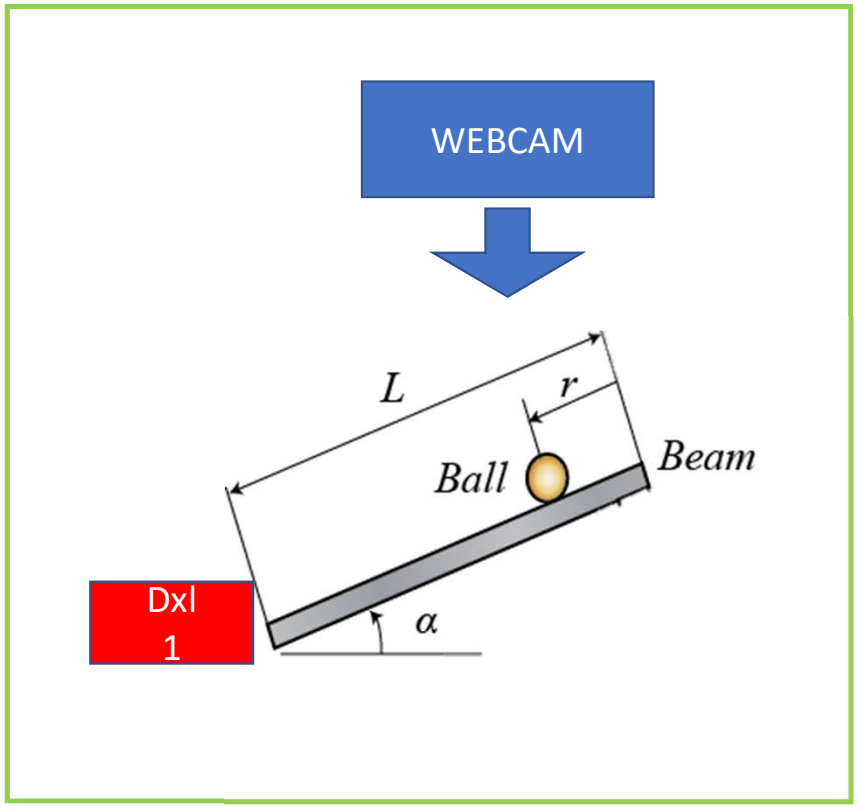
Why Ball and Beam?

1. Conventional Dynamic Systems
2. Good application for Education in dynamic and control
3. Ball balancing still remains as an open topic.
4. Educational device companies sell ball balancing kit to teach undergraduate students dynamics and control
5. In graduate course, DYI ball balancing system is considered as one of final projects in advanced control classes

Drones and Autonomous Systems Lab @ UNLV

1. Introduction – Goal

E-mail : dongbin.kim@unlv.edu
Drones and Autonomous Systems Lab, UNLV



Course Goal

1. 1 Degree of freedom ball balancing system with camera feedback
2. OPENCV – Camera Sensor to achieve the ball's characteristics
3. Robot Operating Systems (ROS) Practice
4. Final Project : Build your own ball and beam system

Drones and Autonomous Systems Lab @ UNLV