Hochschule Konstanz
Fakultät Informatik

App-controlled LEGO robotic arm

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Mobile Computing WS2018/19

URL: http://uc-lab.in.htwg-konstanz.de

Motivation

State of the Art

Construction

Kinematics

Application

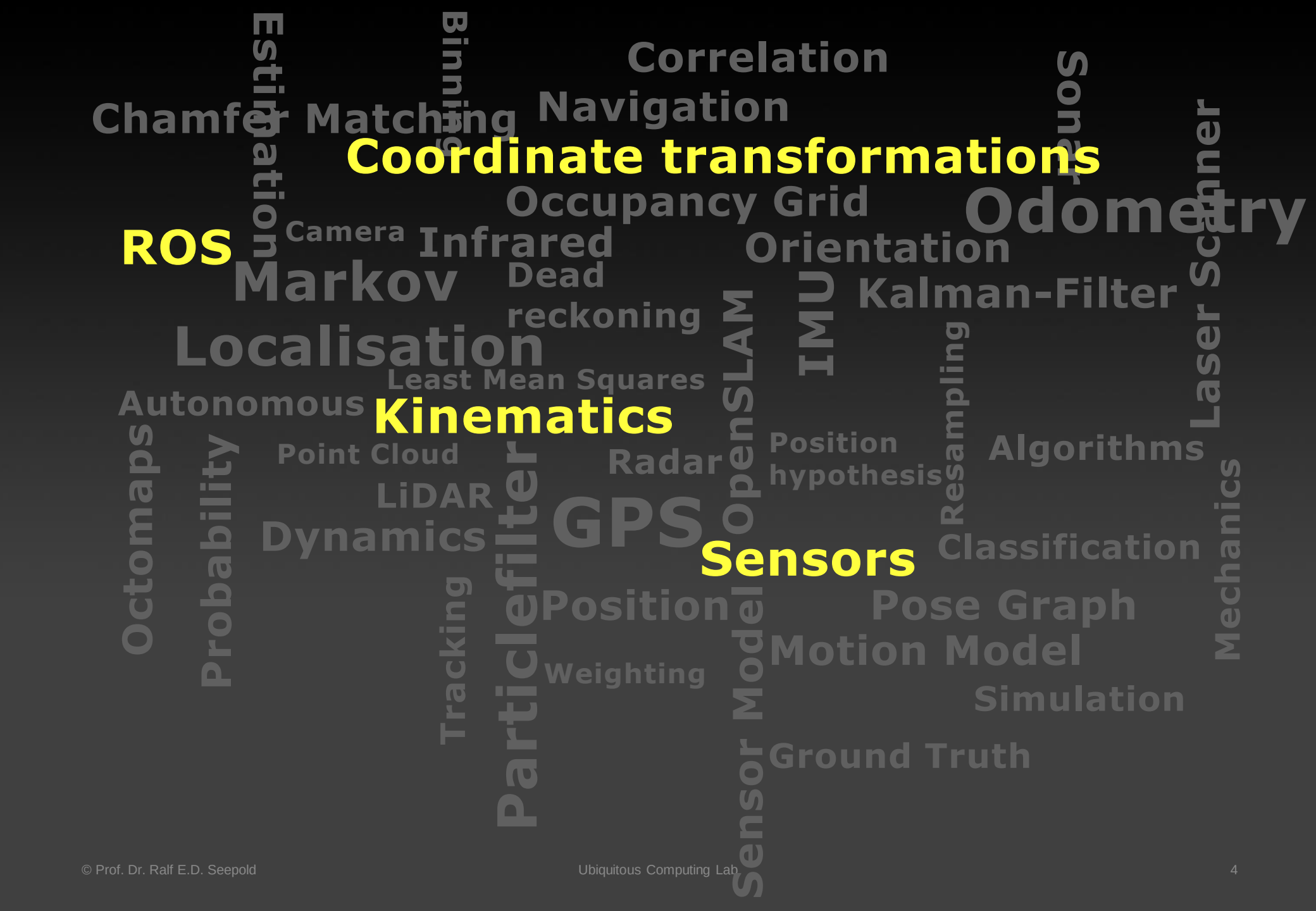
Demo

Motivation

Material recycling

Use in teaching

Easy start in robotics

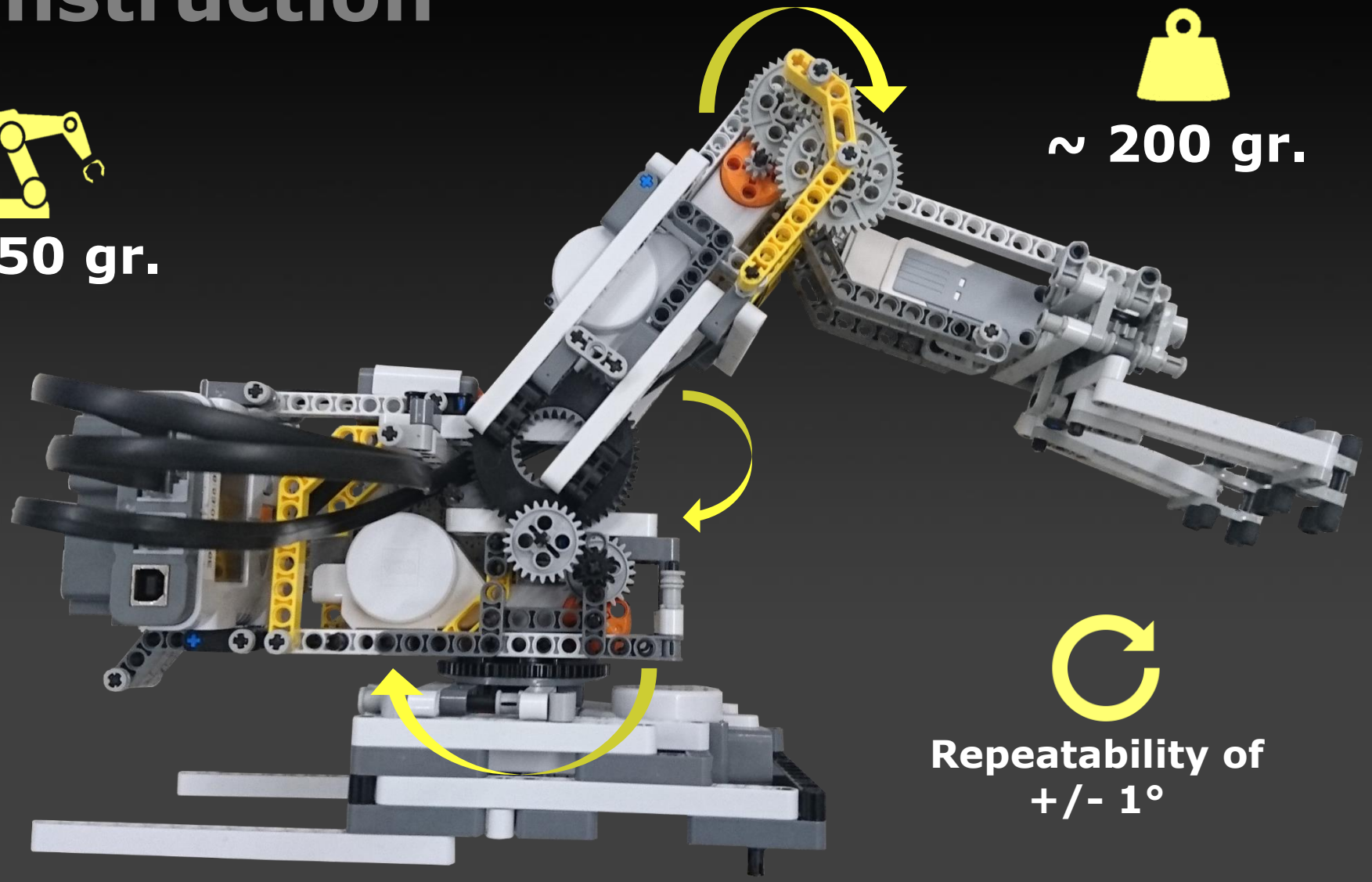

Correlation
Navigation
Chamfer Matching
Coordinate transformations
Occupancy Grid
Odometry
ROS
Camera
Infrared
Orientation
Markov
Dead reckoning
Kalman-Filter
Localisation
IMU
Laser Scanner
Least Mean Squares
Autonomous
Kinematics
Resampling
Position hypothesis
Algorithms
Point Cloud
Radar
LiDAR
GPS
OpenSLAM
Classification
Dynamics
Sensors
Position
Pose Graph
Motion Model
Weighting
Simulation
Ground Truth
Octomaps
Probability
Tracking
Particlefilter
Sensor Model
Mechanics

State of the Art

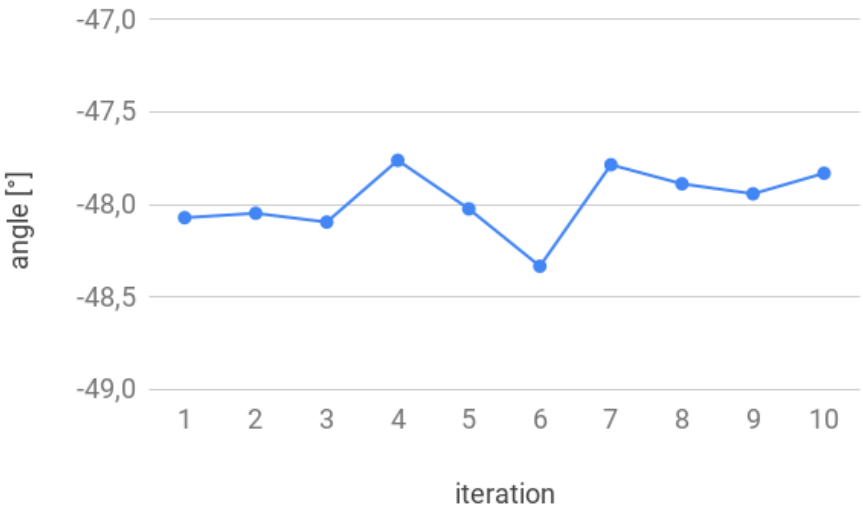
Construction

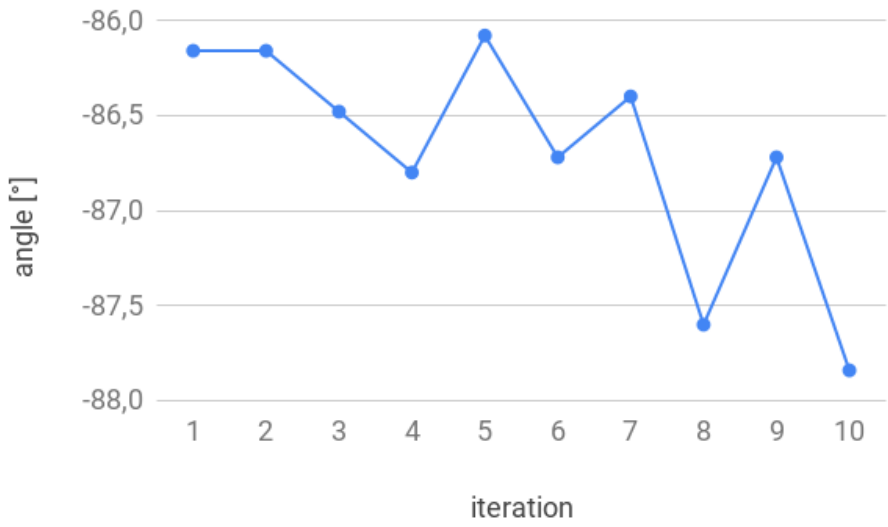
~ 150 gr.

~ 200 gr.



Repeatability of
+/- 1°


-47,0
-47,5
-48,0
-48,5
-49,0
angle [°]
1
2
3
4
5
6
7
8
9
10
iteration


-86,0
-86,5
-87,0
-87,5
-88,0
angle [°]
1
2
3
4
5
6
7
8
9
10
iteration

Forward Kinematics

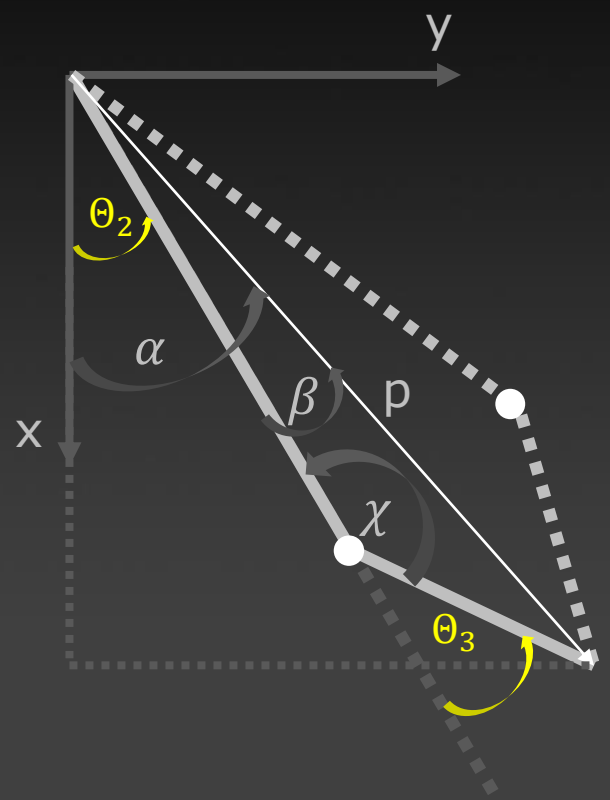
$$T_0^3 = T_0^1 * T_1^2 * T_2^3$$

$$T_i^{i-1} = Tl(0, 0, d_i) * R(z, \Theta_i)$$

$$T_i^{i-1} = \begin{matrix} cos(\Theta_i) & -sin(\Theta_i) & 0 & l * cos(\Theta_i) \\ sin(\Theta_i) & cos(\Theta_i) & 0 & l * sin(\Theta_i) \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{matrix}$$

$$p_{tcp} = T_0^3 * (0 \quad 0 \quad 0 \quad 1)^T$$

Inverse Kinematics



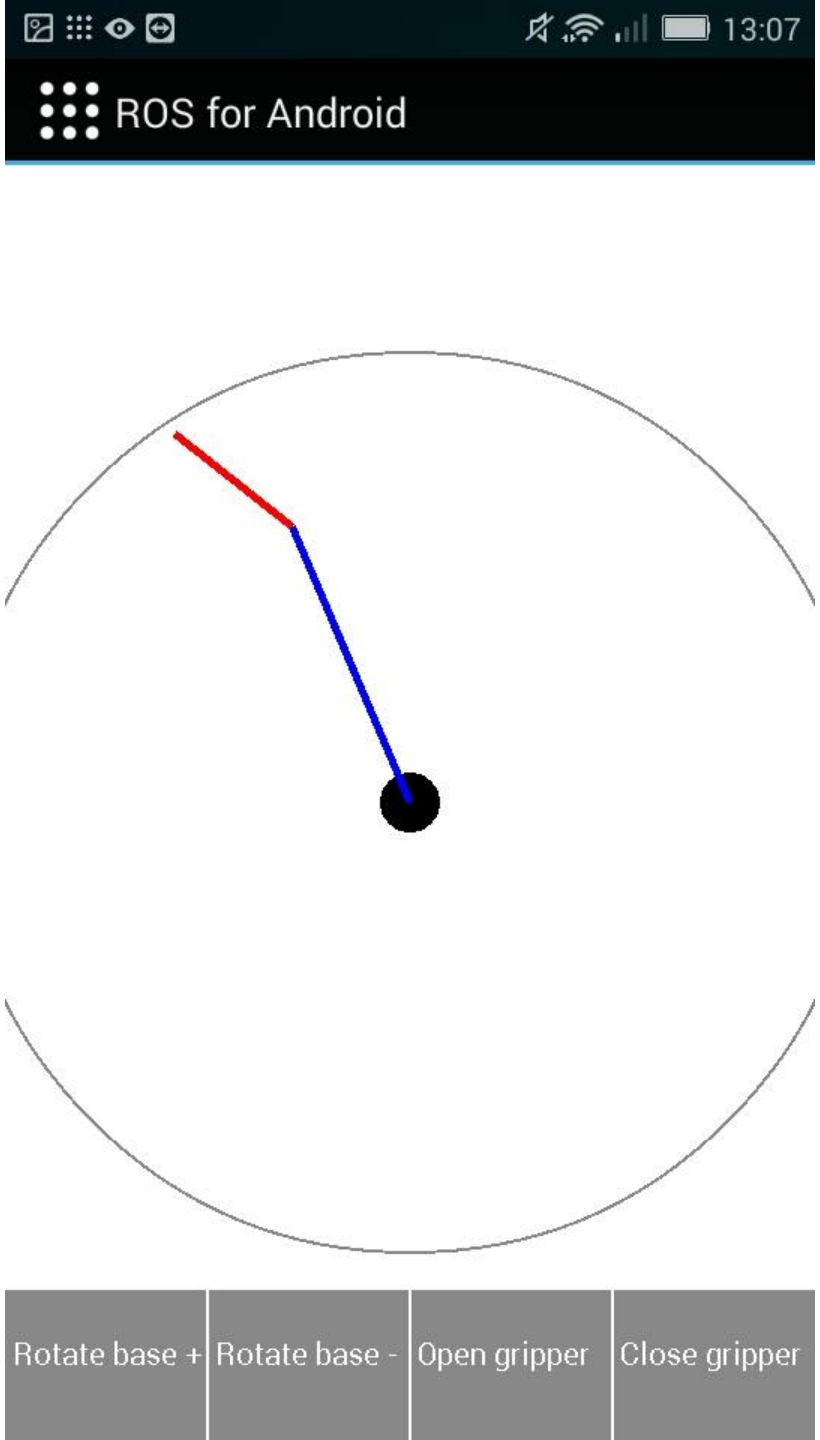
Law of Cosines

$$l_2^2 = l_1^2 + |p|^2 - 2 * l_1 * |p| * cos(\beta)$$

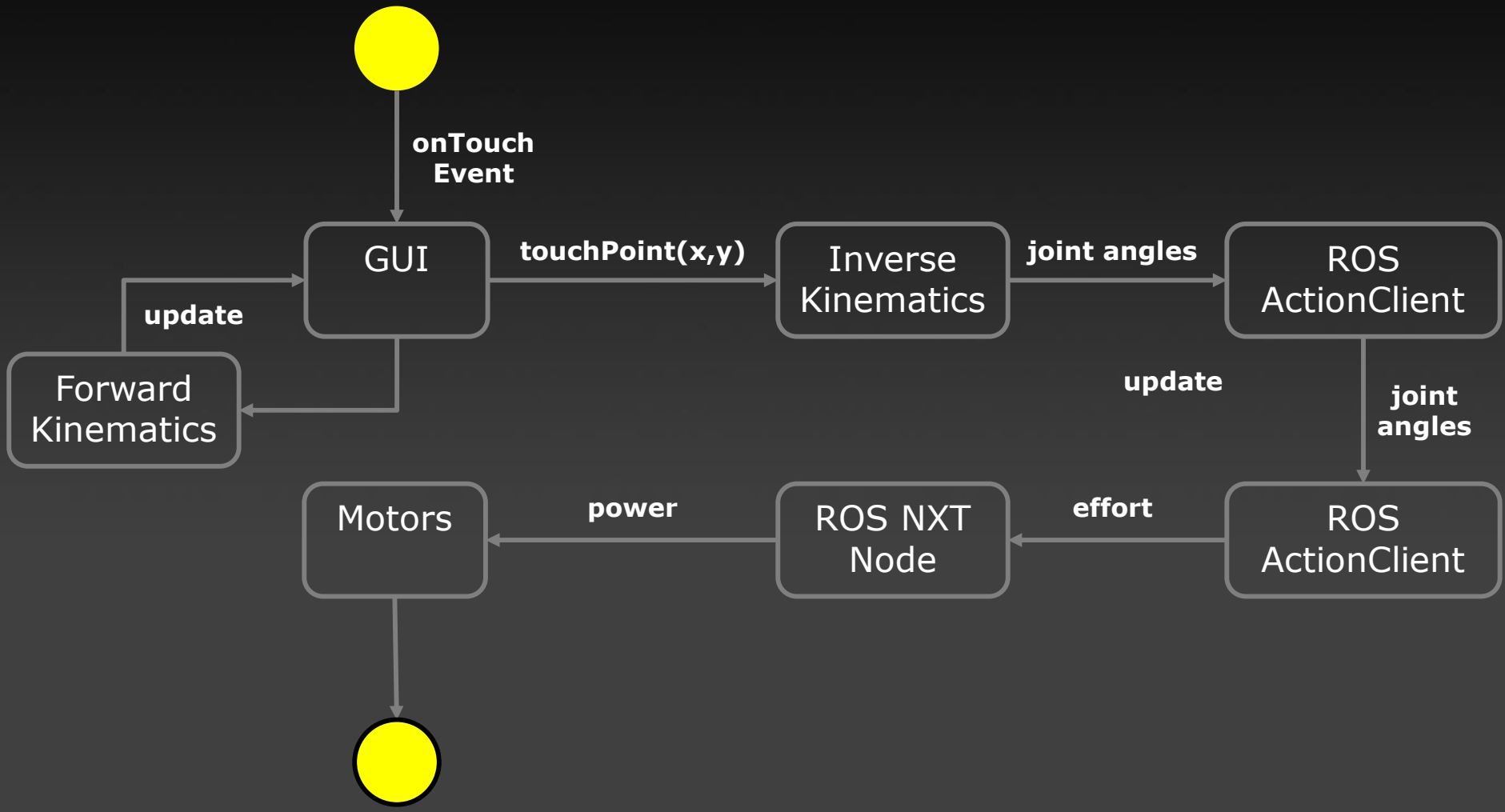
$$\beta, \chi$$

$$\Theta_1 = \alpha - \beta, \Theta_2 = \pi - \chi$$


Gripper +
Gripper -
Gelenk 2 +
Gelenk 2 -
Gelenk 1 +
Gelenk 1 -
Basis +
Basis -


13:07
ROS for Android
Rotate base +
Rotate base -
Open gripper
Close gripper

Application - Pipeline



Thanks for your attention. Questions?

Your name here

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