Visual Navigation for Flying Robots – Project Proposal

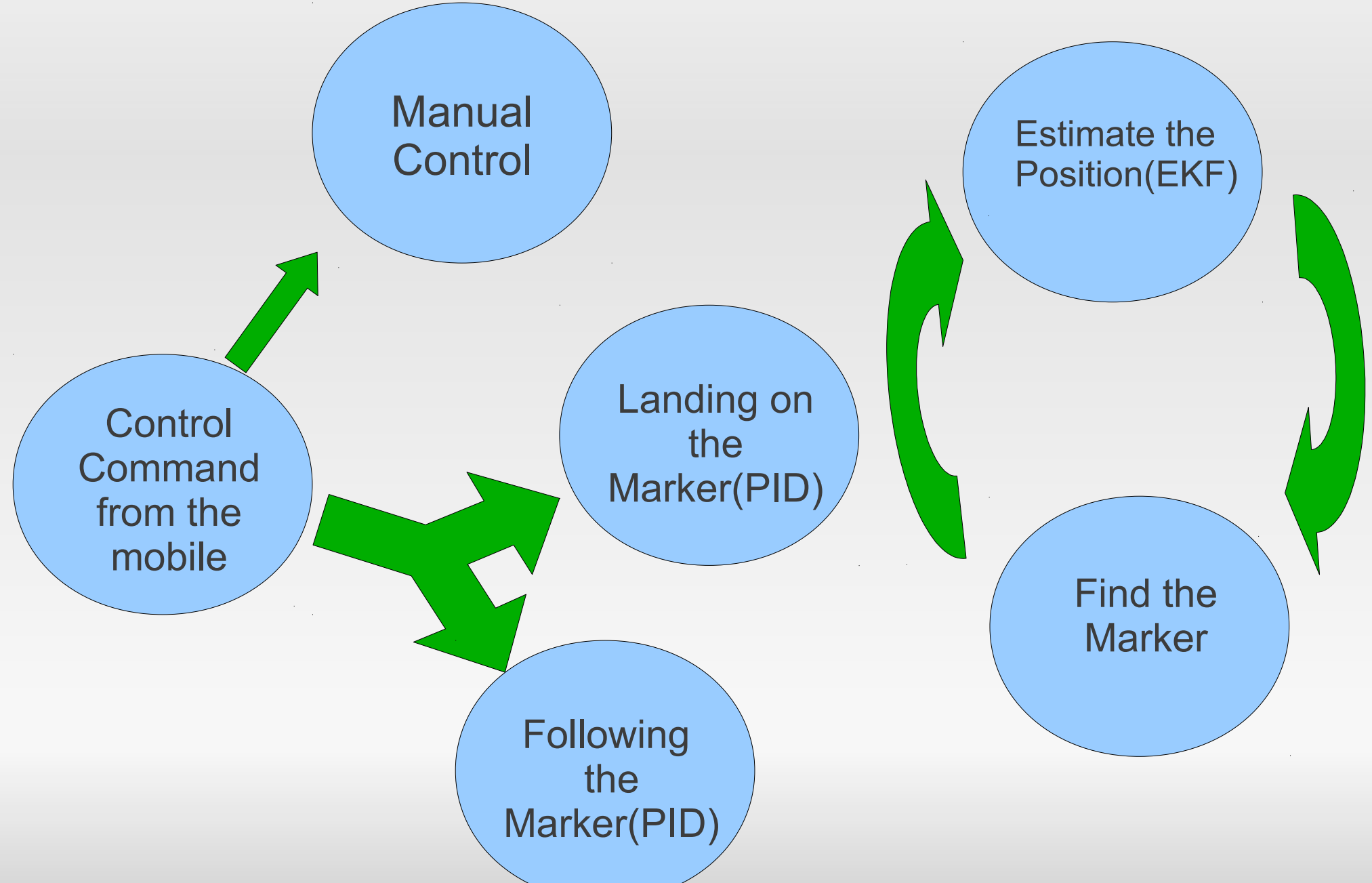
Autonomous Landing on the Moving Platform

presented by
Ross Kidson, Karol Hausman, Sebastian Nagel

Motivation

- Controlled landing in difficult environments
- Following the marker implicitly
- Control with the Android Smartphone

State Graph


Manual Control
Control Command from the mobile
Landing on the Marker(PID)
Following the Marker(PID)
Estimate the Position(EKF)
Find the Marker

Problem Specification

- Extended Kalman Filter :

$$\bar{\mu}_t = g(\mu_{t-1}, u_t)$$

$$\mu_t = \bar{\mu}_t + K_t(z_t - h(\bar{\mu}_t))$$

- PID controller :

$$u_t = K_P(x_{\text{des}} - x_t) + K_D(\dot{x}_{\text{des}} - \dot{x}_t) + K_I \int x_{des} - x_t \text{d}t$$

Problem Specification

- Safe landing:
  - Iteratively shrink the distance between the landing platfrom and the quadrocopter
  - Changing the desired position dynamically in the PID controller
  - If quadrocopter height is below certain treshold → land on the platform

Approach

- rosjava on Android for mobile control (Sebastian Nagel)
- EKF for position estimation (Karol Hausman)
- PID controller for remaining in the desired position (Karol Hausman)
- Landing on the moving platform – generate the trajectory for safe landing (Ross Kidson)

Implementation Plan

1) Mobile control and Landing are separate tasks → better collaboration in the group
2) Implement landing on the static platform, test the performance
3) Implement landing on the moving platform, test the performance
4) Add the mobile control

Challanges and Future Work

- Working on the real robot → uncertainty about the performance in different environments
- Possible extentions:
  - Mobile interface to control many aspects of the robot → written on Android
  - Landing on the moving platform without the marker
  - Identification landing zones

Autonomous Landing on the Moving Platform

Questions?

Thank you for your attention.