



NTNU – Trondheim
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Recovery of Fixed-wing UAVs on Ships Using an Arrest Mechanism Suspended Between Two Multi-rotors

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Outline

- Motivation
- Existing systems
- Linecatch concept
 - Data flow
 - Operation scenario
 - Coordination control
- Future work

Motivation

- Why fixed wing UAVs?
 - Long range
 - Heavy payload
- Fixed wing UAV operations from ships
 - Search and rescue
 - Sea ice monitoring
 - Oil spill monitoring
 - Wild life surveying
 - Etc...
- Recovery is challenging!

Existing systems

- Landing in net



Source: <http://rep13.lsts.pt/en/blog/sanity-tests-and-wavy-first-trial>

Existing systems

- Landing in net
- **VTOL**



Source: http://www.top-enggroup.com/images/pigeon-V_01.jpg

Existing systems

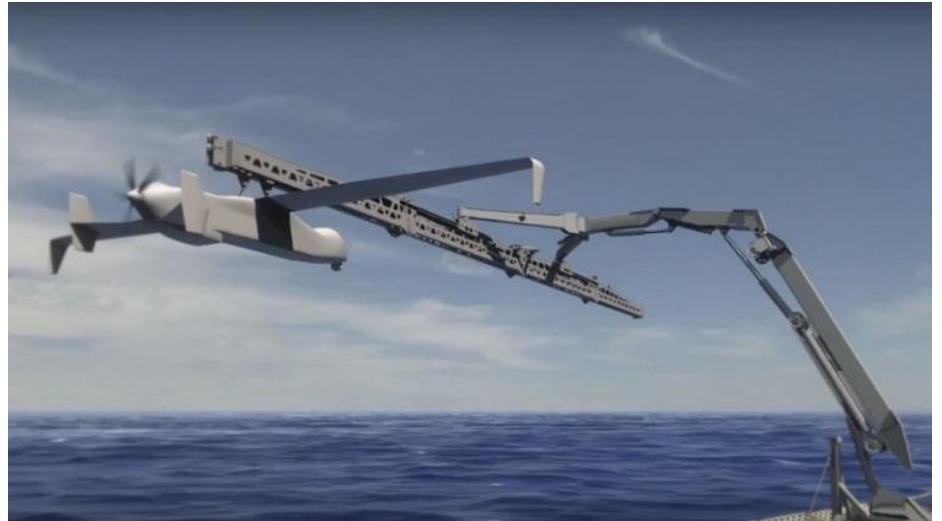
- Landing in net
- VTOL
- **ScanEagle**



Source: <https://www.youtube.com/watch?v=NY1Y9LBATHo>

Existing systems

- Landing in net
- VTOL
- ScanEagle
- **Darpa Sidearm**



Source: <https://www.darpa.mil/news-events/2017-02-06>

Existing systems

- Landing in net
- VTOL
- ScanEagle
- Darpa Sidearm
- **ZipLine**

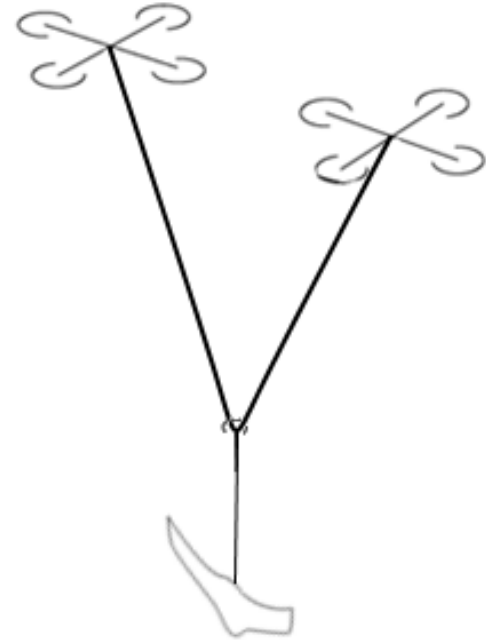
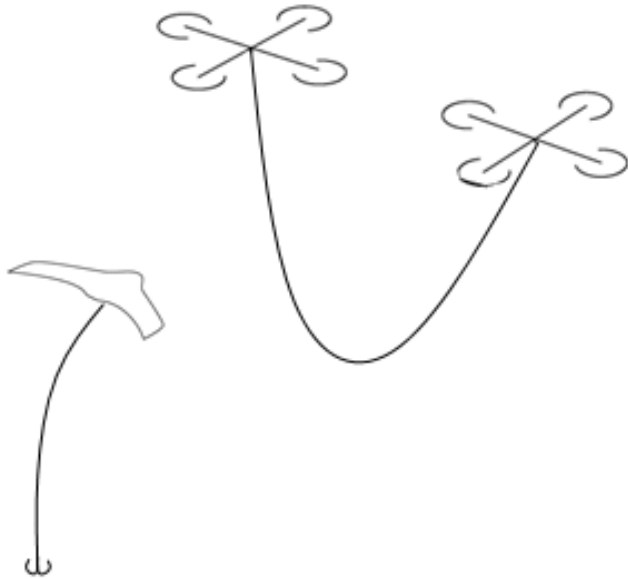


Source: <https://www.youtube.com/watch?v=3AZF1TTDdEM>

Existing systems

- × Risk to personnel
- × Interference with other operations
- × Challenging in wind
- × Challenging in waves

Linecatch concept



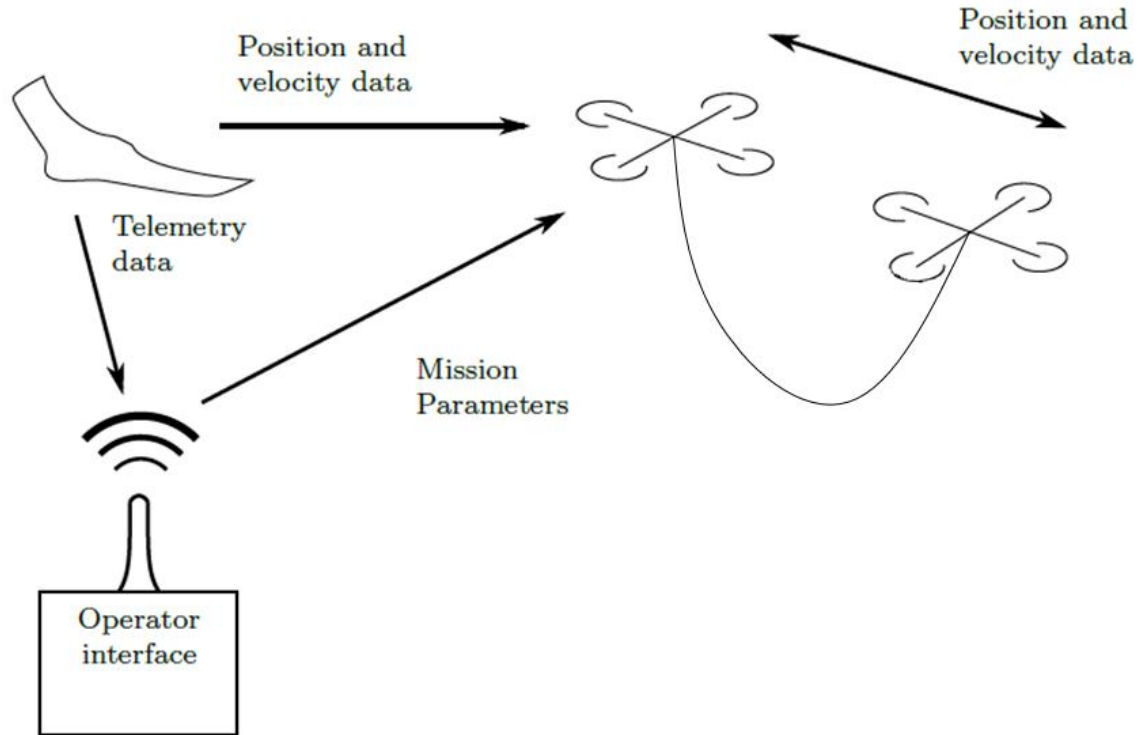
Linecatch concept

- ✓ Low risk to personnel
- ✓ Little interference
- ✓ Works in wind
- ✓ Works in waves

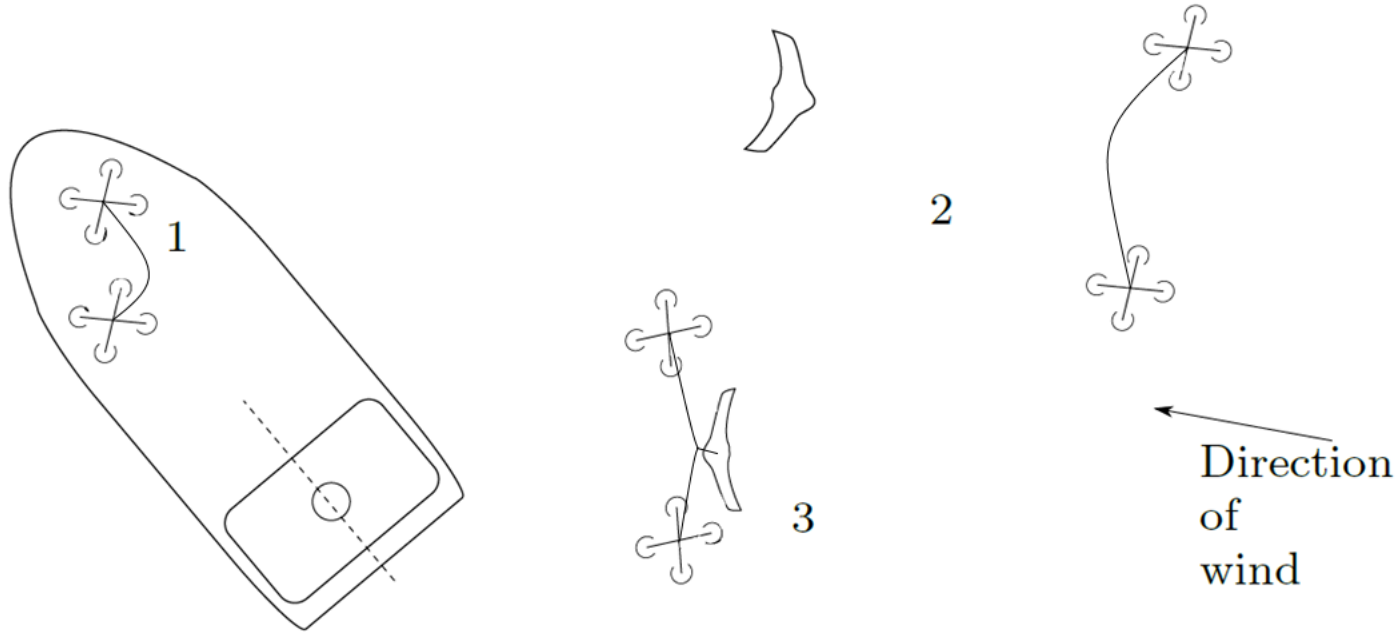




Data flow

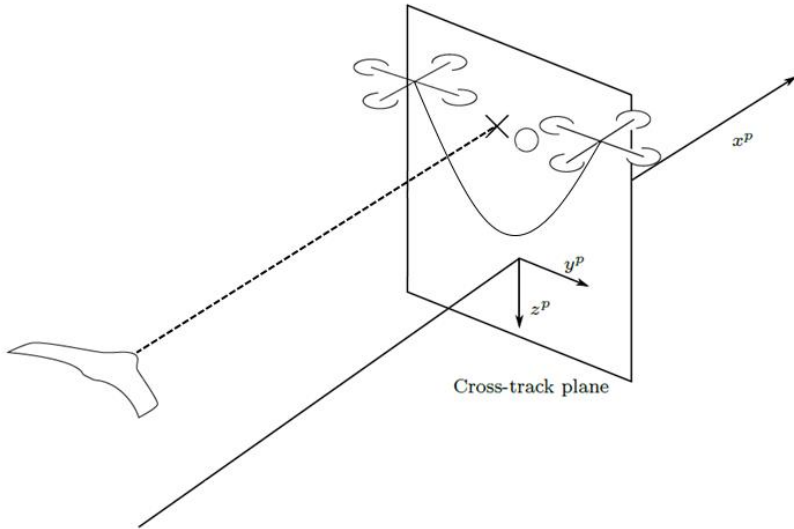


Operation scenario

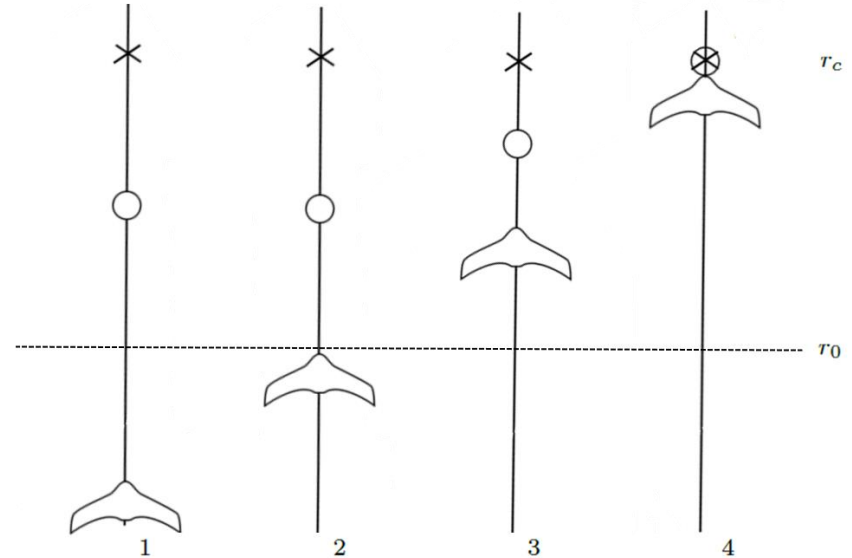


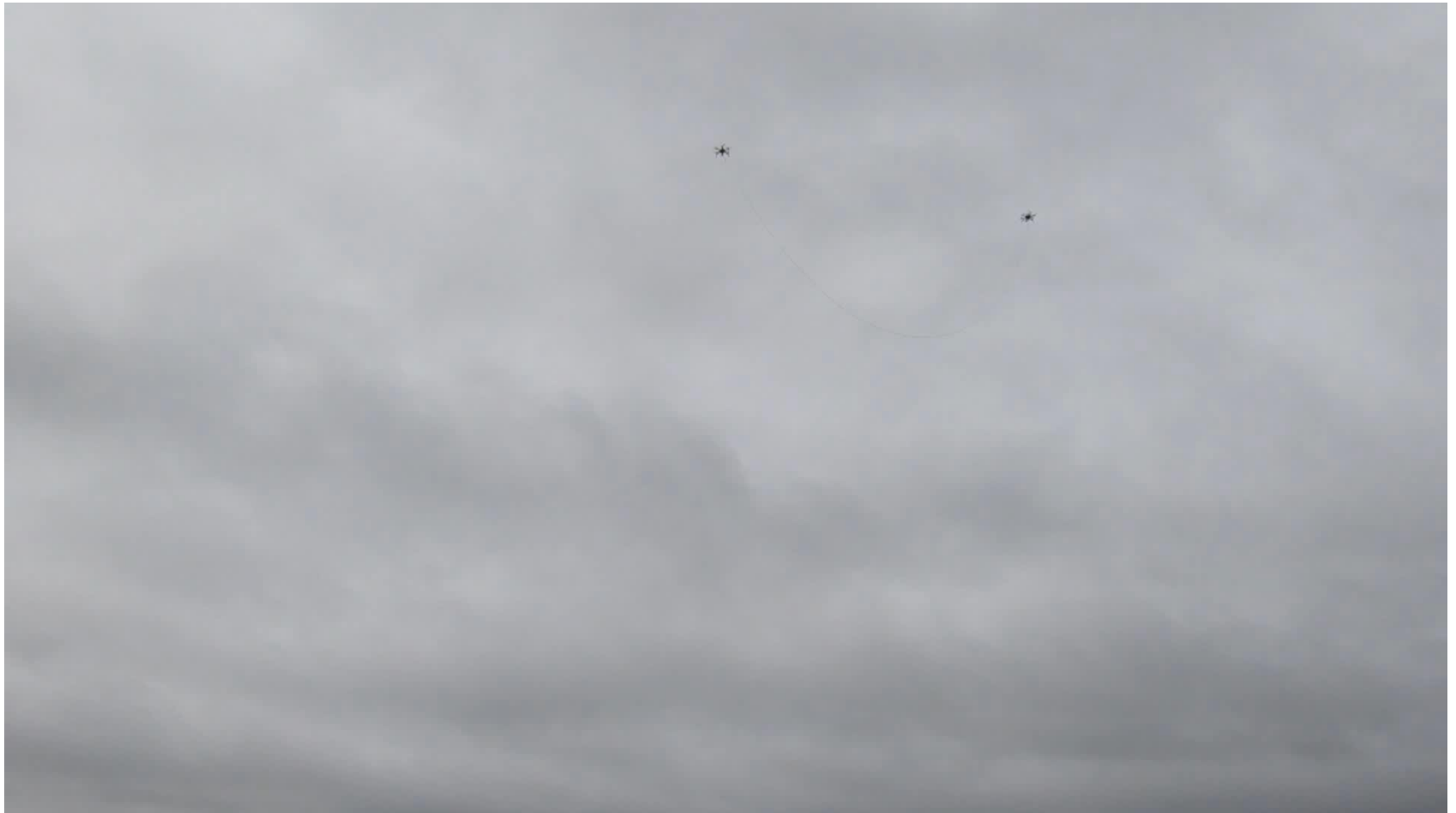
Coordination control

Cross track



Along track





Future work

- Automatic takeoff and landing of multirotor formation
- Fully autonomous linecatch
- Scale up to be able to catch a Skywalker X8



Thank you!

- Test done at Eggemoen 5-8 of November 2018
 - Pilots: Pål Kvaløy (NTNU) and Lars Semb (Maritime Robotics)
 - Video: Carl Erik Stephansen and Kristoffer Gryte