Cooperative Payload Transportation

Aerial CPT

Terrestrial CPT

Cable Suspension

Rigid Grasp

Rigid Grasp

Pushing

Centralized

* PID

Distributed

* PD
* Passivity

Decentralized

* PD
* LQR
* Admittance
* MPC
* Bio-inspired

Centralized

* LQR

Decentralized

* Distributed Wrench
* LQR
* Online Payload Mass and Inertia Estimation

Distributed

* MPC

Decentralized

* Robust Optimal Sliding Mode Control

Distributed

* PI

x

z

Leader UAV

Payload

Follower UAV

Cable

Cable

x

z

UAV0

Payload

UAV2

Cable

UAV1

Cable

Cable

Cooperative Payload Transportation

Agent Type

* Aerial
* Terrestrial

Agent Form

* Uniform
* Individualized

Interaction Methods

* Cable Suspension
* Rigid Grasp
* Pushing

Control Architecture

* Centralized
* Distributed
* Decentralized

Swarm Composition

System

Controllers

System

C0

C1

System

C0

C1

Inter-controller communication

x

y

UAV2

Payload

UAV0

UAV1

MPC0

MPC1

System

UAV Agents + Cables + Payload

MPC2

Communication of States to Neighboring Agents

x

y

UAV2

Payload

UAV0

UAV1

--- Permitted Tip Span (PTS)

······ Safety Zone (PTS – ragent)

A close up of a map

Description automatically generated

x

z

Payload

Cable

UAV

MPC Controller

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UAV Dynamics