

Can LiDAR help a robot dog spot what moves?

Working towards connected robot guides for people with visual impairments
RESEARCH INTERNSHIP TURNING LOCAL PERCEPTION INTO SHARED AWARENESS
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Explore the project

The bigger idea

OVERARCHING GOAL

Explore how connected robot dogs could support people with visual impairments through shared sensing.

Why share? Multiple dogs provide redundancy and diverse perspectives. Each dog could watch a different direction and reveal hazards hidden from another viewpoint.

→
Focus: LiDAR perception

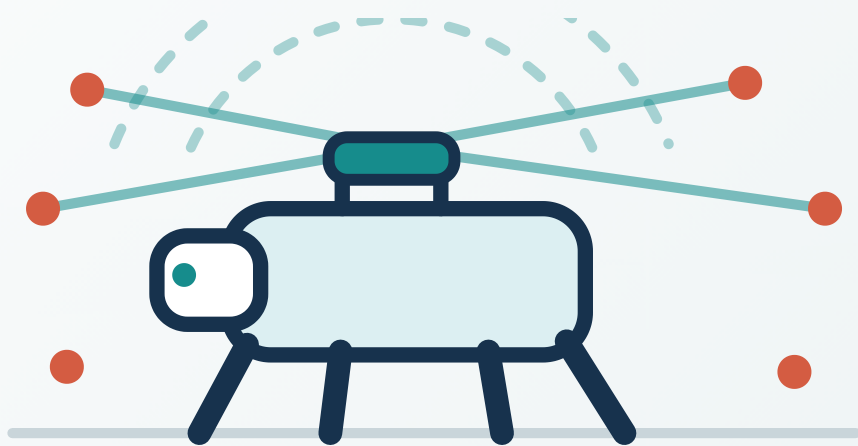
THIS PROJECT

Use LiDAR to build a live 3-D view and distinguish moving people and objects from the static world.

Why motion? People, bicycles and other hazards do not stay where a map left them. A guide needs to identify and track these dynamic hazards so it can assist users in navigating safely.

LIDAR

Build a 3-D picture



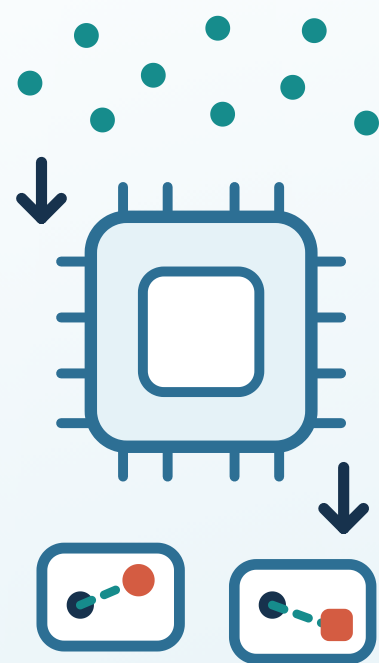
The LiDAR module measures thousands of distances. Together they form a point cloud around the robot.

EXPLORE

How much detail is needed to reveal a small or partly hidden object?

ON BOARD

Reason on the robot



An onboard processor turns sensor streams into nearby object tracks.

Align scans

Compensate for the dog's own movement.

Spot objects

Group nearby changed points into candidates.

Follow motion

Estimate position and direction through short gaps.

Works locally, without a remote computer.

BALANCE

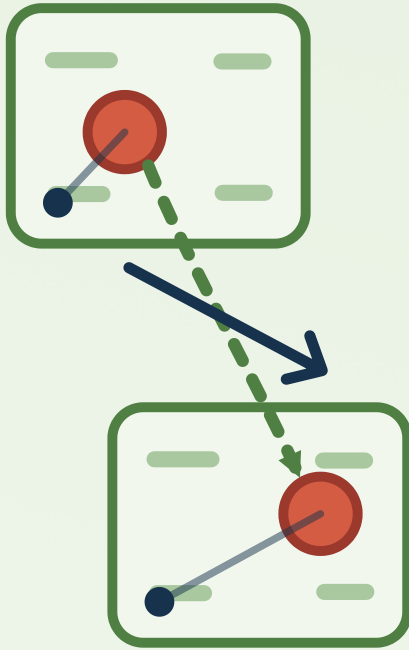
More scans can reveal detail, but waiting for them slows reactions.

EXPLORE

Can it stay responsive in longer trials while the dog moves?

TRACKING

Find what changed



Movement is inferred by comparing aligned observations over time.

Align

Place successive scans in the same map.

Detect change

Find points without a nearby earlier match.

Cluster + track

Group points and estimate position and speed.

CHANGING VIEW

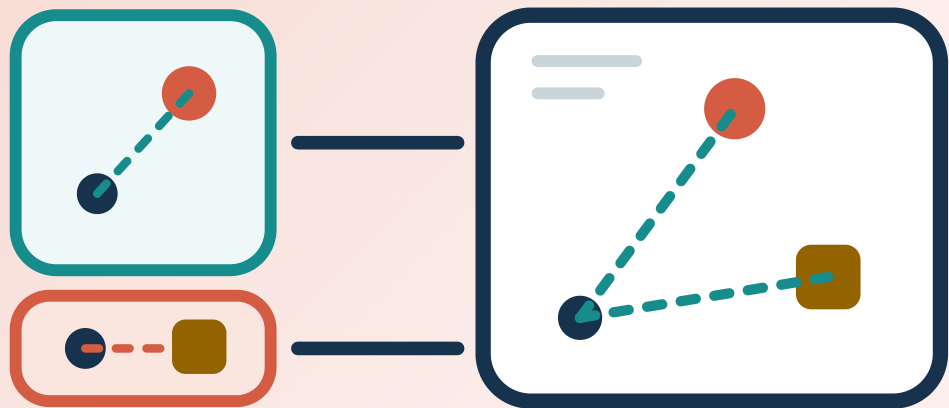
How can newly revealed walls be separated from real motion?

OCCCLUSION

When an object disappears and returns, is it still the same track?



LIVE TEST · LiDAR and tracking ran onboard as a person walked past the stationary robot.



SHARED VIEW

Combine viewpoints

Share compact tracks, match reports of the same obstacle and keep observations seen by only one robot.

CHALLENGE

Time, relative position, identity and wireless gaps can all disagree.

Where could this go next?

Improve perception

Handle occlusion, sparse scans and changing viewpoints more reliably.

Add other cues

Explore cameras, robot state and contextual maps alongside LiDAR.

Share awareness

Test several robots live, including uncertainty and interrupted links.

Design with people

Co-design useful warnings and behaviour with people who have visual impairments.

