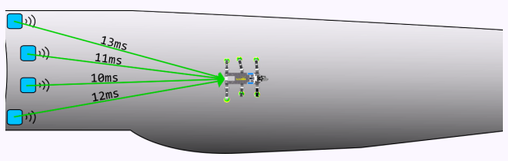
SOLENOID RING

A ring of solenoids is installed at the root of the blade while a microphone sensor is mounted on BladeBug. The solenoids on the ring strike the blade sequentially when BladeBug location is needed. The microphone on BladeBug picks up the signal and records the time of propagation.

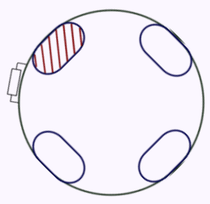
High precision at a low cost

Centimeter-precision tracking at a production cost of £100-£320, which is significantly lower than LIDAR and vision based system



Radial distance calculation

BladeBug calculates the radial distance using the smallest propagation delay from the solenoids and the known propagation velocity of the material.



Circumference location estimation

BladeBug's relative position on the cicumference can be estimated by the position of the solenoid with the least propagation delay.

INTERNAL BEACONS

Beacons which find the distance between themselves and the BladeBug will be used, allowing a technique called multilateration to be employed to find the BladeBug's position.

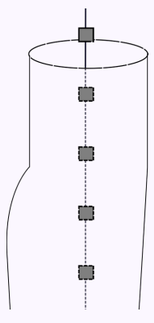
There are two beacon ideas which will be tested: Ultrawide band (UWB) transceivers and microphones which can detect a sound produced by the BladeBug 'knocking' on the blade surface.

Low power setup

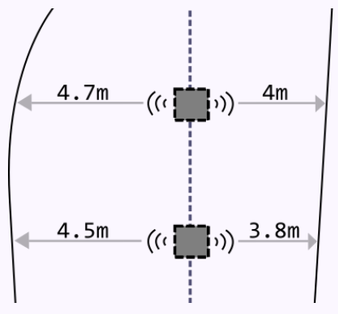
Modular design for easy maintenance.

Built to be easily integrated into the existing robot system

Designed to support 100m+ blades in the future, just like BladeBug



The beacons will be suspended inside the blade, at a known distance from each other, using a tether, which will also carry power and data to the beacons.

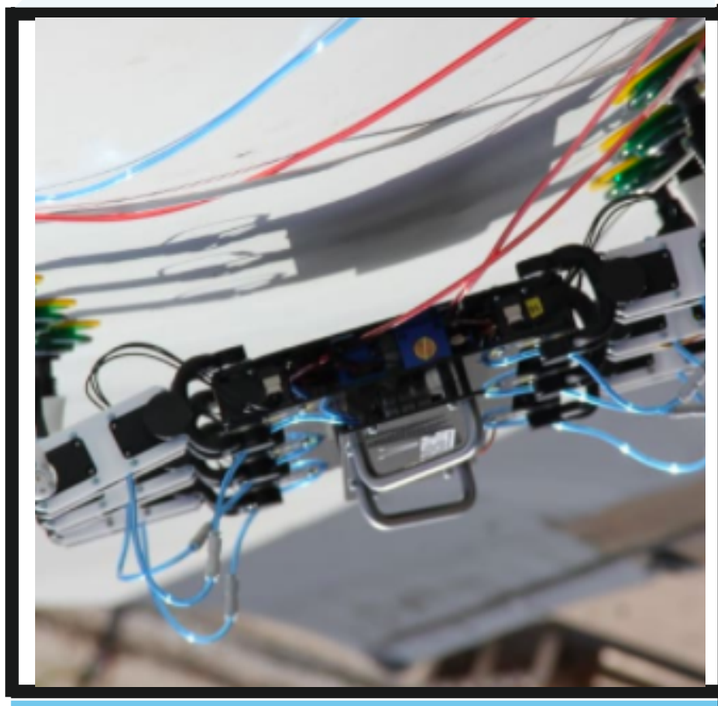


Additionally, each beacon can be fitted with hardware (e.g. ranging sensors) to map the inside of the blade so that the distance of the BladeBug from certain internal 'landmarks' (e.g. Blade edges) can be known.

MARKET RESEARCH

Europe accounted for more than 80% of the global cumulative offshore wind installed capacity.

For localisation systems, the market normally uses LiDAR sensors, which cost thousands of pounds, and vision sensors, which only work over a limited range and require line of sight.



AIM

Manual inspection and repair of blades can be inherently hazardous for the technicians and leads to long shutdown period, which can contribute to significant revenue loss.

Our project will solve the problem of accurately locating BladeBug on the blade, radially and laterally even without line of sight.

BLADEBUG

Wind Turbine Inspection Robot Localisation System