

The real deal



Dr Stephen Sherlock has found an abundance of archaeology at Loftus, including a Saxon Princess

Field Trip

By Joanne

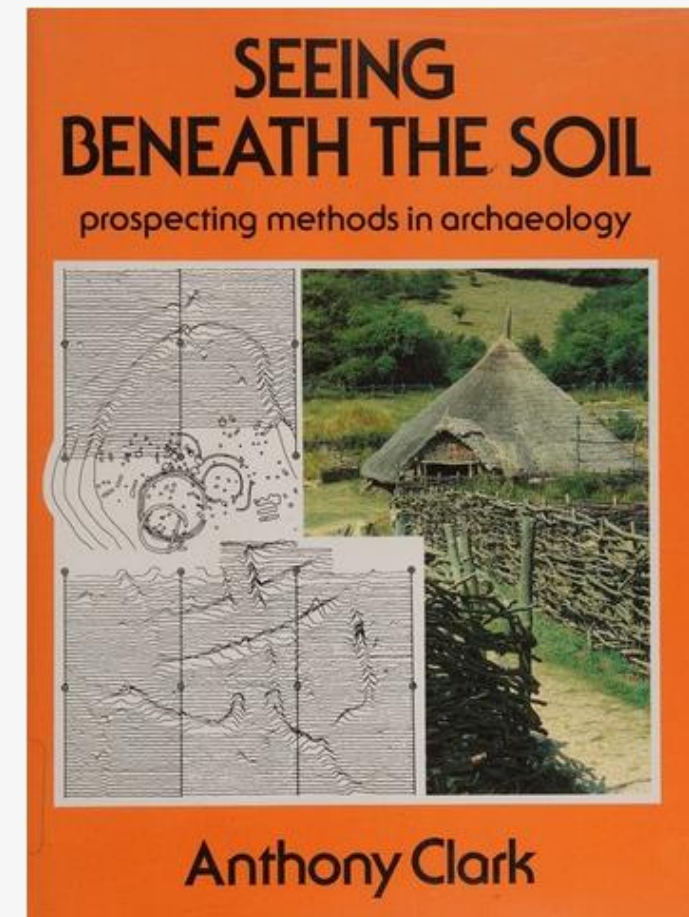
Contextual Enquiry



A world of discovery

Defining the Problem—Challenging Field Equipment

An issue in fieldwork is the usability of equipment like the Geoscan RM85 Resistance Meter. Despite its potential, practitioners report **difficulties with setup, data reliability and its cumbersome and time consuming to use**, as highlighted by a Canadian archaeologist's request for improvement during our recent field trip (Clark, 1996). Such challenges can hinder data collection and slow research progress, emphasising the need for user-friendly, reliable tools.



By Olivia

Innovative Archaeology Solutions

By MINNIONOLGY

The Aim

Identify and research technological challenges in archaeology, including equipment usability and data ambiguity; critically evaluate the pros and cons of advanced surveying methods such as drones and laser scanning; and propose innovative solutions integrating multifunctional robotics, AI-driven analysis, and creative data visualisation to enhance detection accuracy and real-world applicability.

We created an aim using AI

Maybe make a drone?

Drones in Archaeology—Pros and Cons

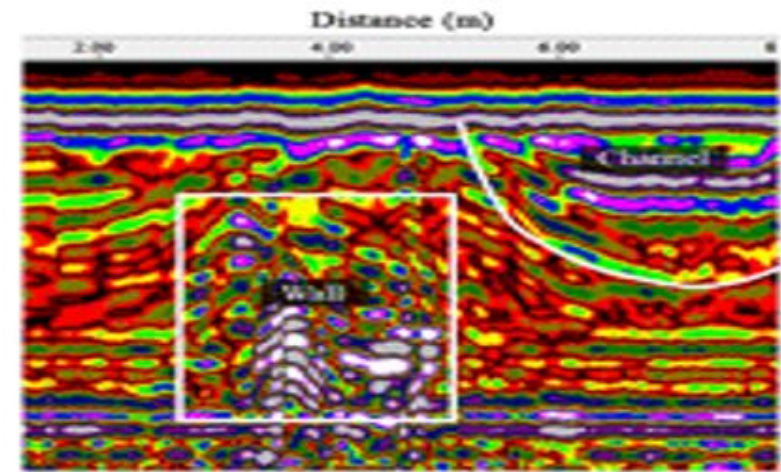
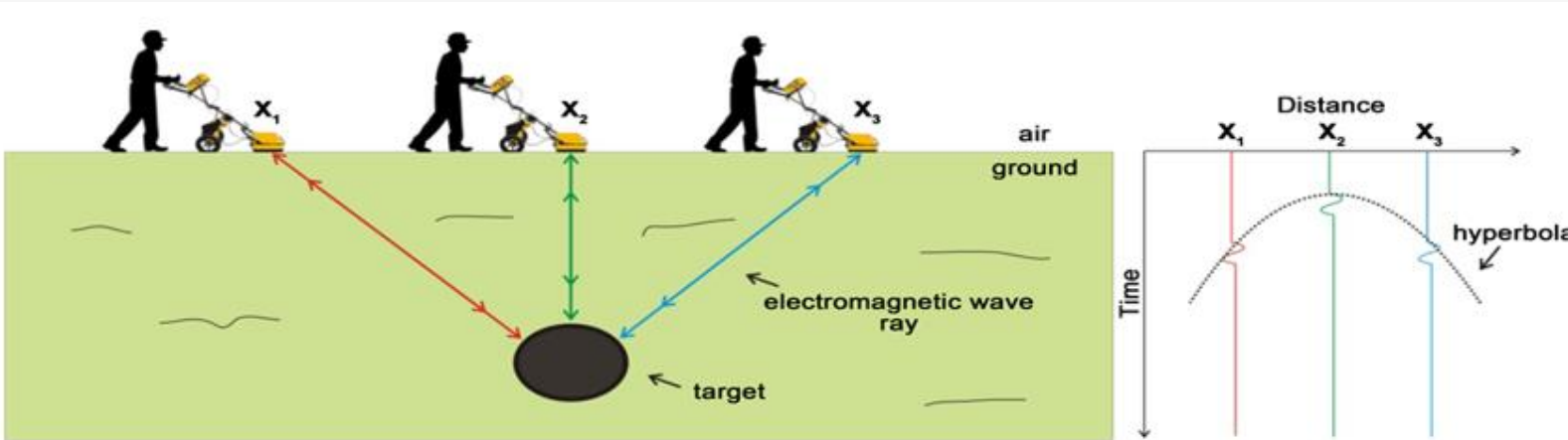
Drones equipped with advanced sensors have transformed archaeological surveying, enabling rapid, cost-effective, and non-invasive mapping of inaccessible or fragile sites (Chiabrando et al., 2017).

- Benefits include
 - high-resolution imagery
 - time efficiency and
 - reduced site disturbance.
- However, limitations include
 - regulatory restrictions,
 - weather dependency, and
 - the need for skilled operators.



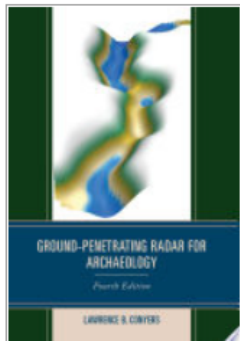
The Data Dilemma - GPR and LiDAR

Ground Penetrating Radar (GPR) and LiDAR have revolutionized site detection, yet both produce complex datasets that require specialist interpretation (Conyers, 2013; Opitz & Cowley, 2013). Misinterpretation can lead to false positives or missed discoveries, particularly in challenging environments.



By Niamh

Ground-Penetrating Radar for Archaeology



Lawrence B. Conyers
Bloomsbury Publishing PLC, 5 Sept 2023 - *Social Science* - 262 pages
Ground-penetrating radar is a near-surface geophysical technique that can provide three-dimensional maps and other images of buried archaeological features and associated stratigraphy in a precise way. This revised edition by the expert in the field, provides the basics of the physics, chemistry, [More »](#)

Search inside

Selected pages



Laser Scanning—Transforming Documentation

Laser scanning provides rapid, detailed, and non-invasive 3D documentation of sites and artifacts (Remondino & Campana, 2014). This technology supports digital preservation, virtual reconstruction, and new analytical methods. However, challenges include high costs, data management complexity, and the need for technical expertise.

- Laser scanning enables detailed 3D site documentation
- High cost and data complexity are barriers

PHOTOGRAPH

LiDAR and Archaeology

Many of the buildings and artifacts of Mesoamerica's civilizations have been hidden by lush rainforest vegetation. Now the technology of LiDAR has helped archeologists to unearth these hidden gems.

INFOGRAPHIC BY NATIONAL GEOGRAPHIC

LIDAR AND ARCHAEOLOGY

WHAT IS LIDAR?

LIDAR stands for Light Detection And Ranging, a technology invented in the 1960s. It's a remote sensing technology system that collects data about ranges, or distances, using lasers. It has a number of benefits:

- It can more easily collect data over a large area.
- It can be used to create maps.
- It can map areas that are not visible to the human eye.

Because of its special features, LiDAR is now being used by archaeologists.

UNCOVERING TIKAL

Because of its ability to "see" through a tree canopy, airborne LiDAR is of particular use in archaeology. For example, at the Tikal site in Guatemala, aerial photography can only show some of the buildings. LiDAR reveals what is under the canopy, helping archaeologists learn more about the area's agriculture, population size, and other aspects of the Mayan civilization that they did not know before.

MAIN PARTS OF AN AIRBORNE LIDAR SYSTEM

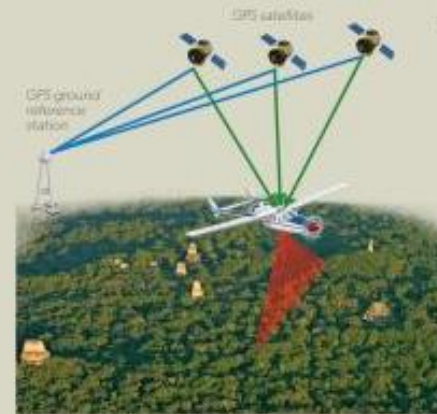
Plane/Helicopter/Drone—carries the moving technology

Laser—sends out an echo pulse

Laser Sensor—detects the reflected pulse to measure the range

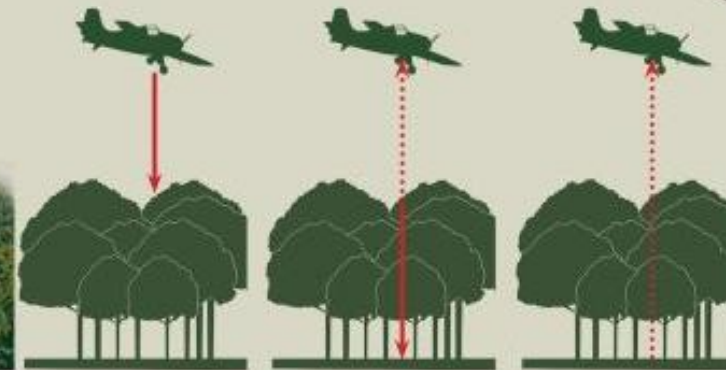
Global Positional System (GPS) ground reference and satellites—detect aircraft position

Inertial Measurement Unit system (IMU)—determines aircraft's orientation



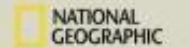
Lasers sweep across the terrain measuring the range and scan angle to ground.

A camera sees only the nearest objects, not what's underneath the canopy.



LIDAR IN ACTION

Vegetation limits aerial photography. It does not limit LiDAR. Where light can go, LiDAR can go. LiDAR pulses reflect from multiple points, starting at the first item they hit, and continue to the ground. So LiDAR can provide information about things that people cannot see.



Multifunctional Robot-drone

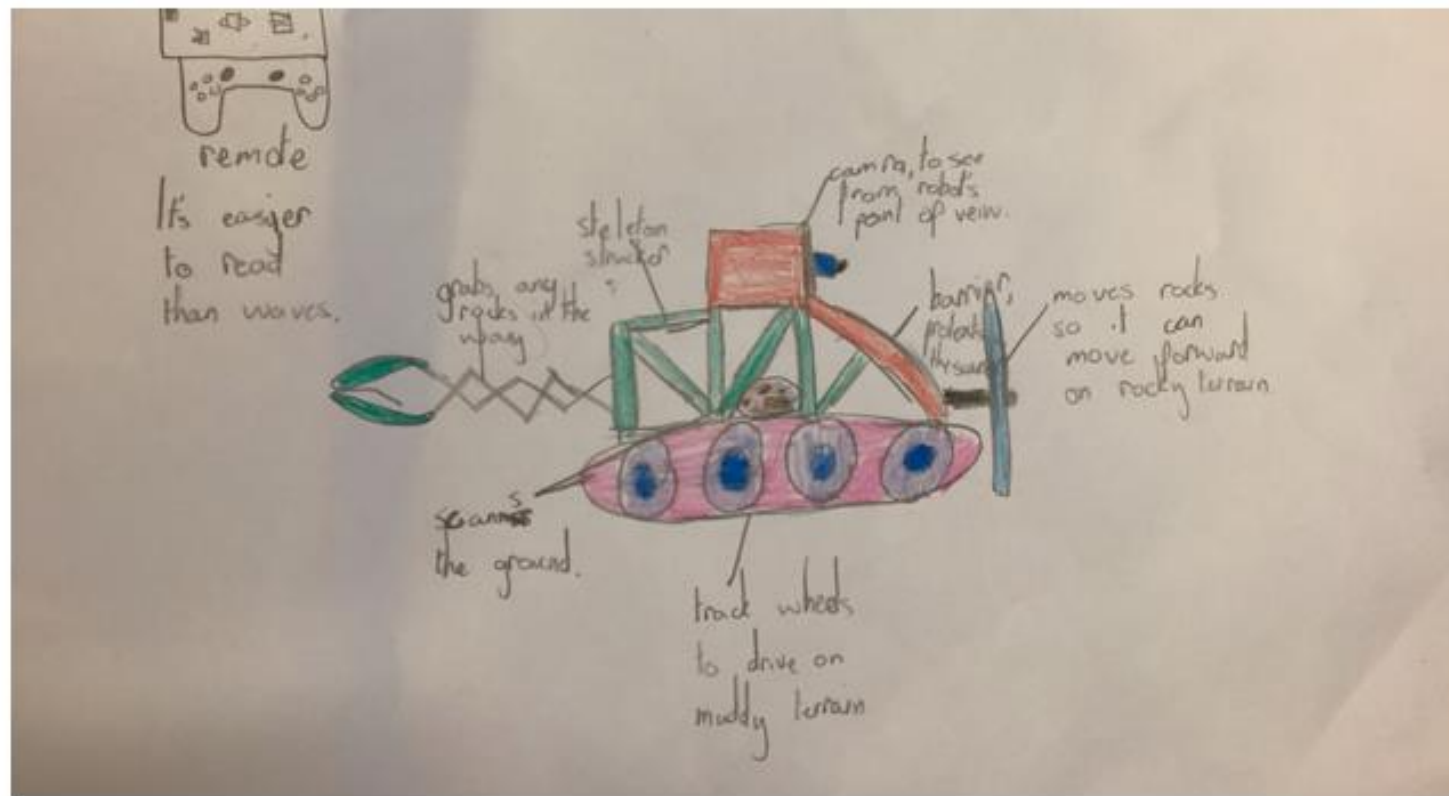
Our idea

Combine ground and aerial sensing technologies into a multifunctional robot-drone.

Such a system could then integrate GPR, LiDAR, and other advanced sensors such as photogrammetry, thermal work to allow seamless data collection across diverse terrains.

This approach would create a multi-method data collection that we wanted to fuse together to enhance detection and accuracy.

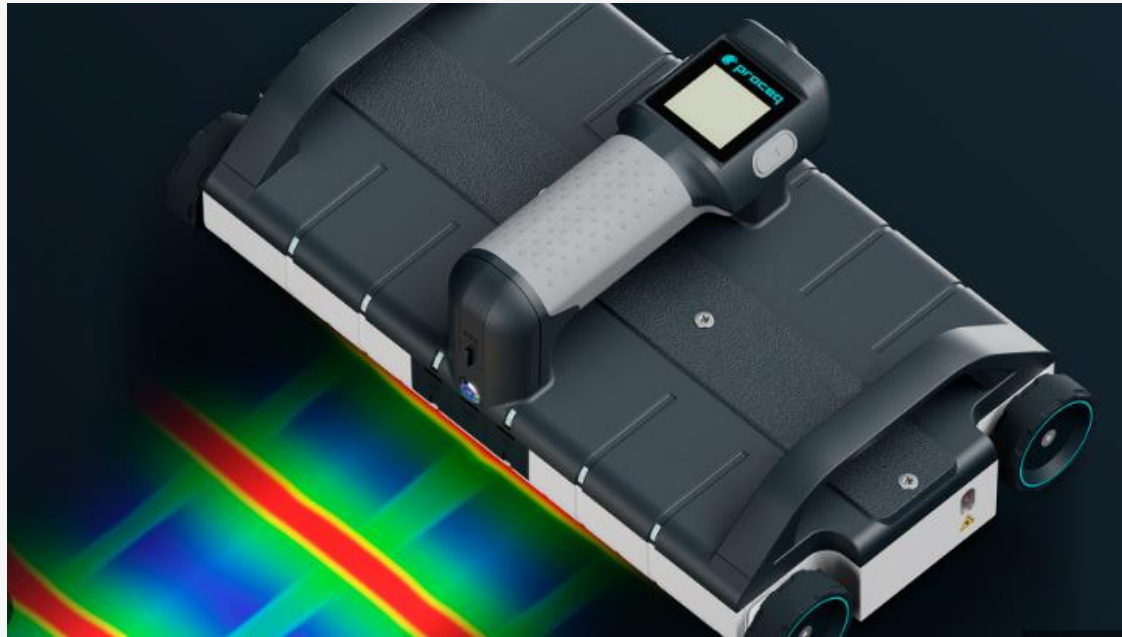
- Multifunctional robots combine complementary technologies
- Data fusion improves archaeological detection



These are our designs; we drew these to show our ideas towards the project. This really helped us create our multifunctional vehicle. All of us contributed towards these drawings.



Ground Penetrating Radar



Light Detection and Ranging



Magnetometer

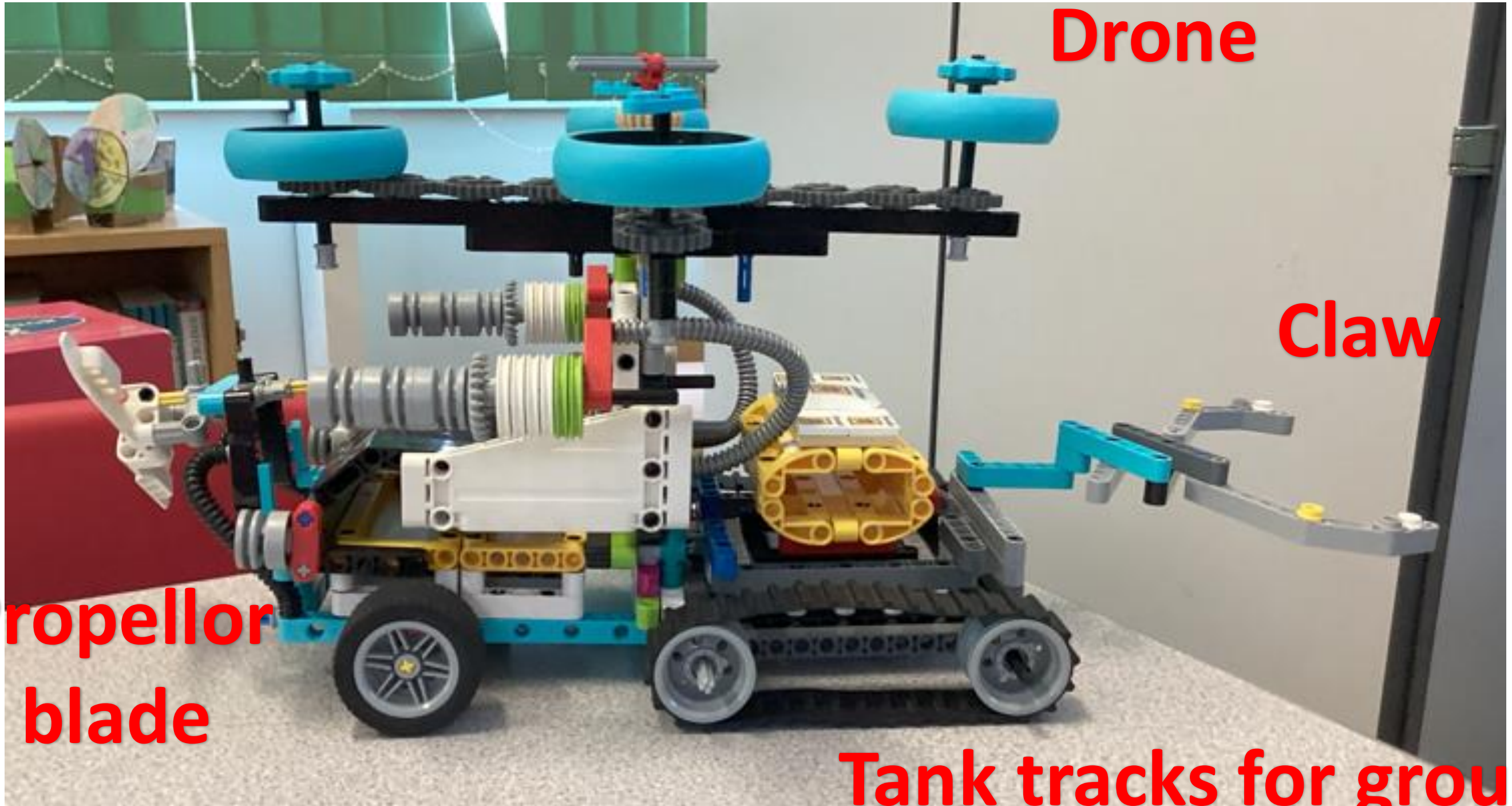


Photogrammetry



Meet

ROB-OT



Drone

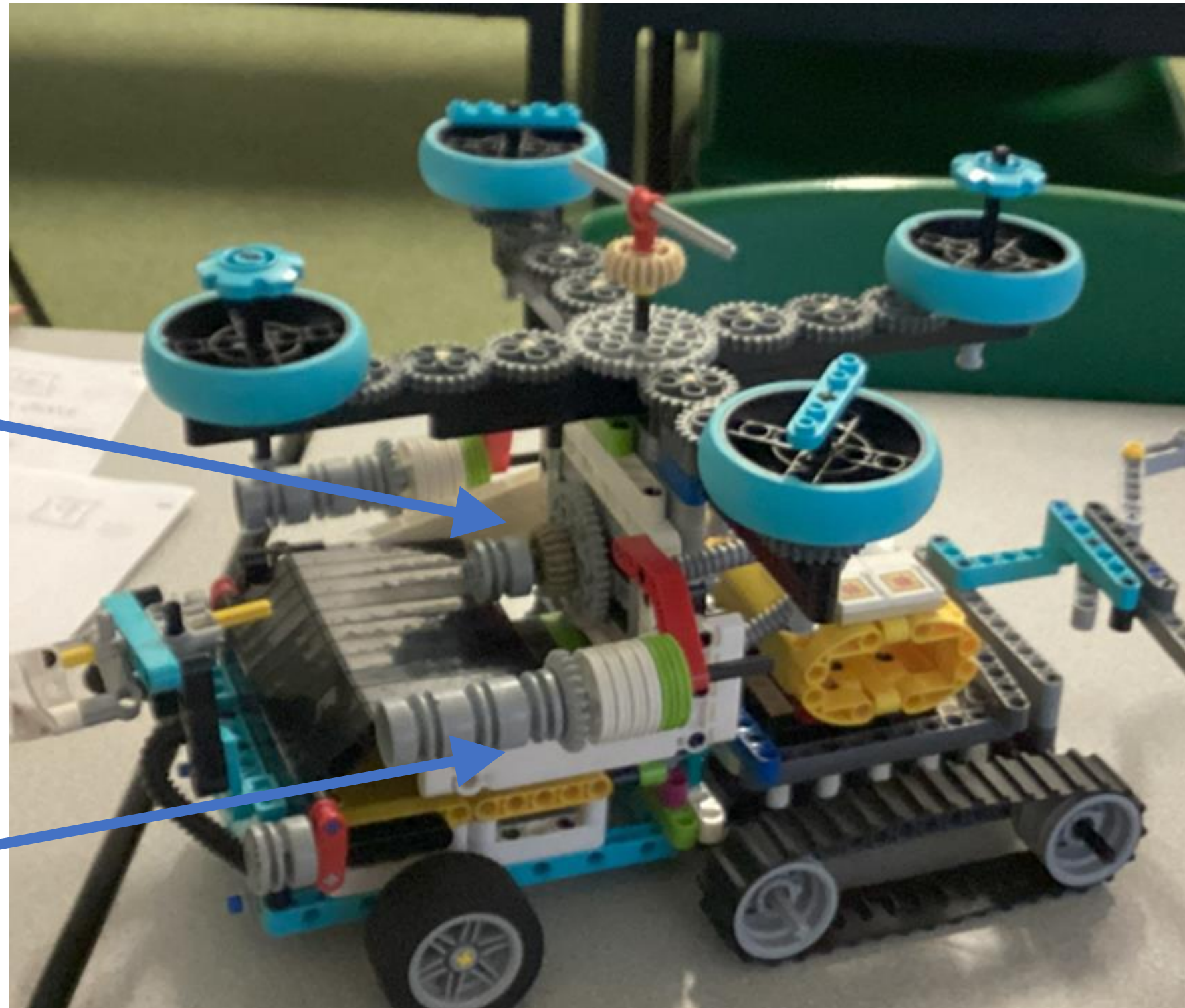
Claw

Propellor
blade

Tank tracks for ground
movement

**Camera to support
movement and
photogrammetry**

**Light detection
(LIDAR)**

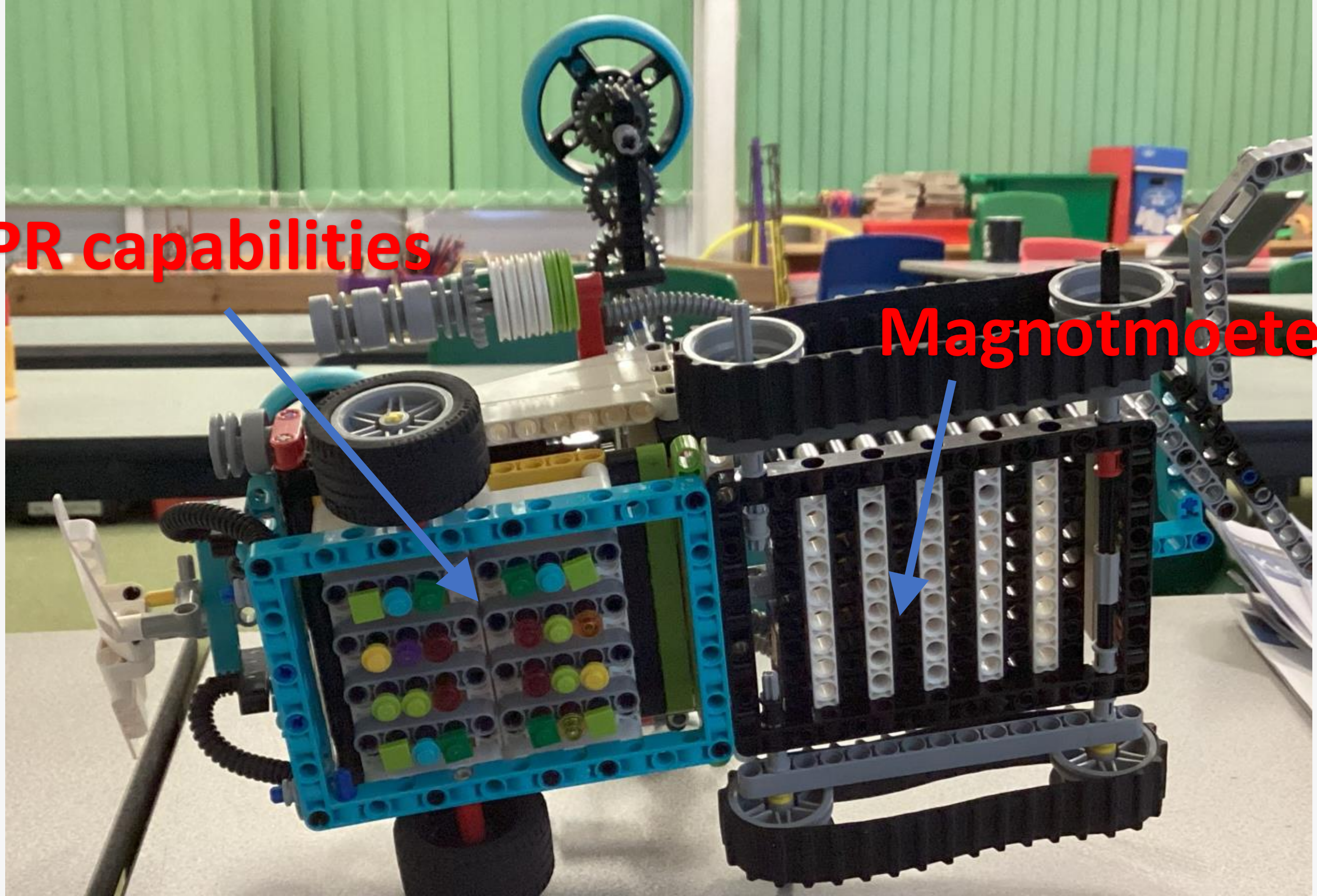




**Rechargeable
solar battery**

GPR capabilities

Magnetometer



Artificial Intelligence— Automating Data Analysis Innovative Archaeology Solutions

Integrating AI into archaeological workflows can automate data processing, reduce human error, and refine feature recognition (Orengo & Garcia-Molsosa, 2021). AI-driven systems can rapidly analyze large datasets, flag anomalies, and support real-time decision-making.

- AI automates and enhances data analysis
- Reduces error and increases efficiency
- Computational thinking is key for future learning

Archaeological Visualization: Towards an Archaeological Information Science (AISc)

Marcos Llobera

© Springer Science+Business Media, LLC 2010

Abstract This paper reviews and evaluates the potential use of modern visualization techniques in archaeology. It suggests the need to apply and develop such techniques as a central part of any modern archaeological investigation. The use of these methods is associated with wider questions about data representations, in particular, their integration with archaeological theory and their role in facilitating analysis and shaping interpretation. Concern for these questions and with the overall potential that information systems provide to capture, represent, analyze, and model archaeological information suggests the need for a new interdisciplinary focus, Archaeological Information Science. For such a focus to prosper, archaeologists need to develop additional skills that go beyond mere technical ones. They need to become more active in the design and creation of future information archaeological systems. To this end, archaeologists are urged to view this task as a way to extend archaeology in new directions and to recognize that the digital representation and treatment of archaeological information can generate new forms of doing archaeology.

To change a hyperbola (which would exist as a mathematical curve or image file) into an in-game image in Minecraft, you can use **external tools** that convert images into Minecraft-compatible formats, such as **map art generators** or **pixel art converters**.

Visualising Data—From Hyperbolas to Minecraft

A novel approach involves transforming complex geophysical data (e.g., GPR hyperbolas) into accessible, game-like visualizations using pixel art or Minecraft map generators. This makes abstract data tangible and engaging, supporting both professional analysis and public outreach (Llobera, 2011).

- Data visualization enhances accessibility and engagement
- Minecraft-style graphics support learning
- Creative tools bridge technical and public understanding

