

Step-by-Step Project Plan: Upgrading a Komodo Tank into a Semi-Autonomous, Person-Tracking Vehicle with Solar Power

1. Project Scoping and Requirements Gathering

- Define the operational goals: path following, obstacle avoidance, person tracking (facial/personal features), and solar power integration.
- Assess the Komodo Tank or Komodo Tank Mini's current hardware and software capabilities, including power systems, control interfaces, and available mounting space[1].
- Identify required performance metrics (range, speed, autonomy duration, recognition accuracy).

2. System Architecture Design

- Develop a modular system architecture that integrates: Autonomous navigation (path following and obstacle avoidance) Person tracking (vision-based) Solar power system Vehicle control and safety override

Key Subsystems

| Subsystem | Main Components | || | Navigation | GPS, IMU, wheel encoders, onboard computer | | Obstacle Avoidance | LIDAR, ultrasonic sensors, cameras | | Person Tracking | HD camera, facial/person recognition software | | Solar Power | PV panels, charge controller, battery interface | | Vehicle Control | Motor controllers, drive-by-wire interface |

3. Hardware Upgrades

A. Sensors and Computing

- Install GPS and IMU for localization.
- Add LIDAR and/or ultrasonic sensors for real-time obstacle detection[2][3].
- Mount high-resolution cameras for both navigation and person tracking.
- Integrate an onboard computer (e.g., NVIDIA Jetson, Raspberry Pi, or industrial PC) for sensor fusion and AI processing.

B. Solar Power Integration

- Design and mount solar panels on available surfaces (roof, hood, sides) using lightweight, durable PV modules[4][5].

- Connect panels to a charge controller and integrate with the vehicle's battery system for supplemental charging.
- Ensure electrical compatibility with existing or upgraded batteries.

4. Software Development

A. Autonomous Path Following

- Implement path following algorithms such as Pure Pursuit, Model Predictive Control (MPC), or Sliding Mode Control for robust trajectory tracking[6][7].
- Use mapping software to define drivable paths and waypoints.

B. Obstacle Avoidance

- Develop or integrate obstacle detection and avoidance algorithms using sensor data (LIDAR, cameras, ultrasonic)[2][3][8].
- Employ machine learning or reinforcement learning for adaptive behavior in complex environments.

C. Person Tracking and Recognition

- Deploy facial recognition or person re-identification software capable of real-time processing[9][10].
- Use a database of authorized faces or features for identification.
- Implement logic for the vehicle to follow or maintain a specific distance from the tracked individual.

D. System Integration and Control

- Develop middleware to synchronize navigation, obstacle avoidance, and person tracking modules.
- Implement remote control and emergency override features.
- Ensure all systems communicate with the vehicle's actuators (steering, throttle, brakes).

5. Testing and Validation

A. Bench Testing

- Validate each subsystem independently (navigation, obstacle avoidance, tracking, solar charging).
- Simulate scenarios using software-in-the-loop (SITL) and hardware-in-the-loop (HITL) testing.

B. Field Trials

- Conduct controlled environment tests for path following and obstacle avoidance.
- Test person tracking and following in varied lighting and terrain conditions.
- Evaluate solar charging rates and impact on operational duration.

C. Iterative Refinement

- Collect data, analyze performance, and refine algorithms and hardware as needed.
- Address any safety, reliability, or usability issues.

6. Deployment and Documentation

- Finalize system integration and perform full-vehicle tests.
- Train operators on system use, safety protocols, and maintenance.
- Document all hardware changes, software configurations, and operating procedures.

Additional Notes

- Solar power integration is primarily for supplemental charging and range extension, not as a sole power source[4][5][11].
- Facial/person recognition should comply with privacy and legal requirements.
- Modular design enables future upgrades (e.g., improved AI, additional sensors).

This plan provides a comprehensive roadmap for transforming a Komodo Tank or Komodo Tank Mini into a semi-autonomous, solar-assisted vehicle with advanced navigation and person-tracking capabilities.

Citations: [1] Pindad Komodo -

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