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Parktopia: A Parking Management Proposal for Old Hilliard

Abstract

Imagine if parking in Old Hilliard was no longer a guessing game. What if you could check a screen, or your phone, and instantly see where open spots are, color coded and updated in real time? What if that same system helped reduce traffic, boost local business, and even paid for itself through digital ad revenue?

Parktopia is that solution.

Built on cutting edge Department of Defense computer vision technology, Parktopia transforms simple camera feeds into a live parking map that updates continuously—no sensors, no trenching, no guesswork. It uses solar powered, LTE connected camera units to monitor parking stalls and broadcasts real time availability to digital signs and apps. When parking demand drops, the system dynamically switches to display paid advertisements, generating passive income for the city. This proposal outlines how Parktopia can be deployed in Old Hilliard as a low cost, high impact upgrade to downtown infrastructure—easing congestion, improving the visitor experience, and supporting economic growth.

1. Introduction

Old Hilliard is growing, but its parking system isn't keeping up. On weekends and during city events, drivers spend too much time circling lots, adding to congestion and missing out on

everything downtown has to offer. In fact, studies show up to 40% of urban traffic comes from drivers just looking for a spot.

Parktopia fixes this. By using small, solar powered camera nodes, the system detects real time parking availability and broadcasts it to nearby digital signs, mobile apps, and websites. Instead of guessing, drivers go exactly where spots are open—saving time and reducing traffic.

2. Background: Harnessing DoD Originated AI Patents

Parktopia was developed by adapting advanced computer vision patents from the U.S. Department of Defense. These include:

- Shadow Brightening Technology: This module enhances dark or overexposed regions in each frame, allowing vehicle shapes to remain visible even under tree cover or in low light situations.
- Object Detection Methods: The core of our vehicle recognition pipeline uses trained models that were built to identify moving and stationary targets in chaotic environments. These models were retrained using a custom dataset of parking lots in various lighting and weather conditions.
- Human in the Loop Correction: A light oversight layer allows remote users to validate edge cases (such as loading zones or oddly shaped vehicles) without halting the pipeline.

These tools were initially used for surveillance and battlefield awareness. We identified commercial use cases in city infrastructure, specifically for real time parking detection. Parktopia uses this technology to interpret video feeds and distinguish between occupied and unoccupied parking stalls, even in poor lighting or angled views.

3. Existing Solutions and Parktopia's Advantages

Most smart parking systems rely on expensive hardware like in-ground sensors or overhead counters. These require trenching, wiring, and constant upkeep, with costs reaching up to $1,400 per stall.

Parktopia breaks that model. A single $260 solar powered unit monitors up to 200 stalls. Each includes:

- A Raspberry Pi computer
- Camera with HDR and autofocus
- LTE module
- Solar panel + battery

It installs in hours, needs minimal maintenance, and adds value through built in advertising revenue, something traditional systems simply don't offer.

4. System Architecture and Workflow

Each Parktopia unit contains:

- Raspberry Pi 4 with 4GB RAM
- Pi Camera Module v3 with HDR and autofocus
- Quectel EC25 LTE modem for cloud uploads
- 20W Solar Panel mounted to a pole or wall
- 12V 6Ah LiFePO4 Battery (rechargeable up to 2,000 cycles)
- MPPT Charge Controller for efficient solar power handling
- Custom voltage regulator

- Weatherproof enclosure made of 3D printed PETG plastic

The system flow works as follows:

1. Live video is captured by the PiCam and brightened with the DoD derived shadow enhancement pipeline.
2. The Parktopia Vision Engine detects vehicles and determines stall occupancy.
3. Occupancy data is sent via LTE to a secure cloud database.
4. The backend compiles availability into a zoned map (green/yellow/red) viewable on screens or online.
5. When demand is low, the same screen automatically transitions to display scheduled digital advertisements.

5. Commercialization Strategy

Parktopia will begin in Old Hilliard with a targeted pilot. City staff will access a backend dashboard for analytics, while advertisers can book screen time through a simple online portal. Key stakeholders include:

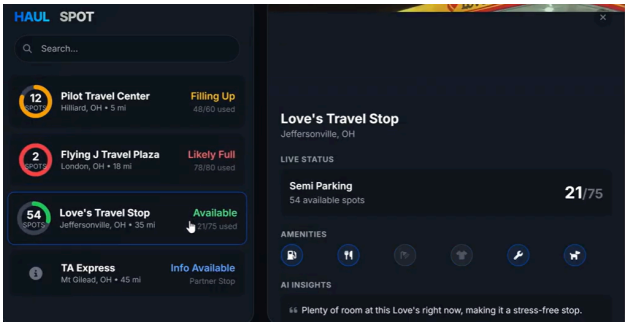
- Local government: Dashboard access + data insights
- Small businesses: Better parking = better customer flow
- Advertisers: High traffic screen time = passive revenue

Each screen is estimated to earn $225–$750/month based on location and impressions. That means the system can eventually pay for itself—while easing traffic.

5.1 Case Study: Trucking Market Variant (Haul Spot)

Using the same detection model, a modified version of Parktopia is designed for truck stops. Called Haul Spot, it filters by vehicle type, recognizing semi trucks and providing accurate stall

counts. A driver friendly UI delivers fast summaries such as “Only 2 truck stalls left,” or “Lot nearly full”. [Functional Demo Here](#).



This version is viable for commercial logistics zones in or near Hilliard, especially for future expansion to service corridors.

6. Deployment Roadmap

The proposed rollout is as follows:

- Phase 1 (2 months): Assemble 1–2 Parktopia units and install near key lots.
- Phase 2 (3 months): Use the system during DORA nights and event weekends for traffic evaluation.
- Phase 3 (4 months): Expand to additional lots, activate the ad portal, and collect feedback.
- Phase 4 (2 months): Link the system to city dashboards and public apps.
- Year 2+: Continue scaling with analytics tools and neighborhood specific versions.

7. Privacy and Compliance

All video is processed securely and blurred before any retention. Faces and plates are anonymized using automated filters. Parktopia complies with U.S. data policies and GDPR guidelines. Live signs will notify the public of the parking monitoring purpose.

8. Goals

- Reduce search time for drivers in Old Hilliard
- Increase turnover and accessibility of downtown parking

- Provide live, accurate parking maps
- Generate advertising revenue via screen idle time
- Give property managers visibility on stall usage
- Offer plug and play scalability for city planners

9. Discussion: From DoD Innovations to Urban Applications

Parktopia is a civilian application of military developed visual intelligence. Through TechLink licensing channels, this tech has been applied to solve a city-level problem with high commercial potential. By using scalable, open source components and field-tested detection models, Parktopia avoids the pitfalls of closed, high maintenance systems while still delivering dependable accuracy. The inclusion of modern cloud software and computer vision shows how municipal problems can be solved with nationally funded innovation.

10. Conclusion

Parktopia is affordable, scalable, and ready to launch now. With minimal hardware, high impact data, and the ability to generate revenue, it solves a pressing problem while modernizing Old Hilliard's infrastructure.

This system will reduce driver frustration, free up valuable time, and keep visitors engaged with the local economy. As a bonus, it gives local technologists and students an opportunity to be part of a real world smart city initiative.

We propose launching a pilot program this year and invite the City of Hilliard to partner with us.

11. Sources

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