JumpGuard

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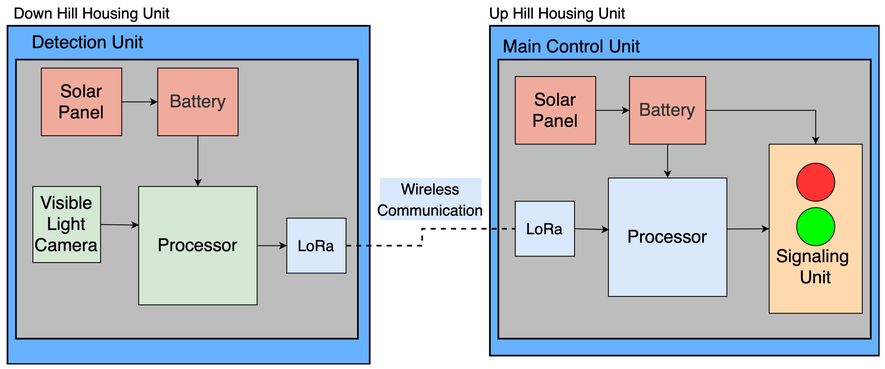
Project Problem/Goal

On a terrain park ski jump, if an athlete crashes on the bottom of a jump, athletes uphill may not be aware of the risk of collision awaiting them at the bottom. A system was designed to detect when the landing area is clear before notifying the next athlete it is safe to proceed.

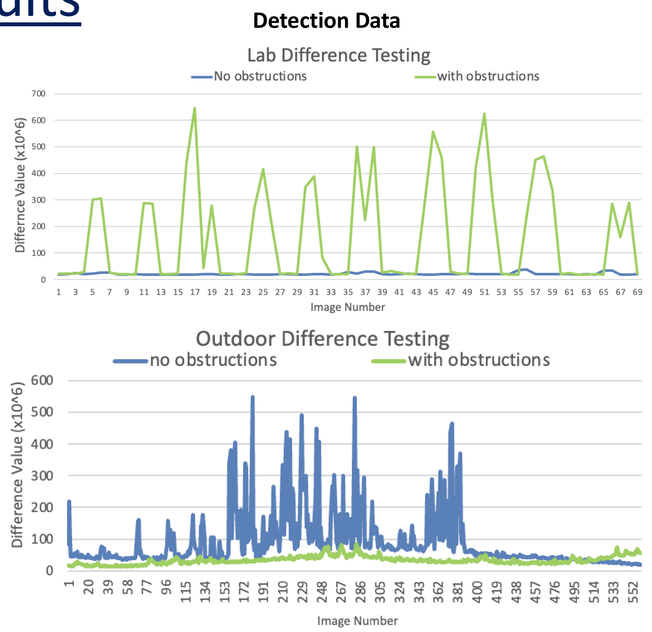
Specifications & Constraints

- Must be able to detect athletes within a 30x30 ft area
- Must have ≥ 95% detection rate
- Must wirelessly communicate up to 60 feet
- Must be able to function in temperatures ≥ 0°F
- Must use solar power as the primary power source
- Must have 7 hours of backup power

Block Diagram



Results



Energy consumption and production

Date	Yield(Wh)	Consumption (Wh)	Start %	End %
4/11/2025	0	80	80%	40%
4/10/2025	160	70	60%	90%
4/9/2025	0	80	80%	60%
4/8/2025	50	80	100%	90%
4/6/2025	60	70	60%	20%
4/7/2025	0	70	100%	60%
4/5/2025	60	80	100%	80%

Design Solution

The JumpGuard design has two housing units, the downhill unit and the uphill unit. Each unit is powered by its own microgrid which includes a solar panel and battery. The downhill unit houses the detection subsystem, which uses a visible light camera to determine the state of the landing area. The detection signal is wirelessly transmitted to the uphill unit, where the processor controls the signaling unit.

Project Summary

JumpGuard is an innovative system designed to improve safety in terrain parks by using real-time image processing to monitor the landing zones of jumps. It detects hazardous obstructions and alerts uphill athletes whether it is safe to proceed. By preventing athletes from committing to jumps with blocked or unsafe landings, JumpGuard helps reduce the risk of serious collisions and enhances overall park safety.