

# Consumer Electronics Case Studies



# Consumer Electronics Image Recognition Solution

Achieved 100% accuracy for required verification image sets



## The Situation

A consumer electronics company was facing intense pressure to accelerate time-to-market and release their next generation product. The company required support with the integration of a vision system to recognize and authenticate reusable components to ensure the highest customer satisfaction.



## Challenges

- Capture accurate images in high motion environment using a low cost camera
- Implement an image processing solution on a highly constrained hardware platform which was not well suited for image processing
- Algorithm needs to perform both recognition and authentication, which requires very different image analysis steps
- Recognition must be completed quickly



## Solution

- Developed discrete camera HW integration
- Developed a highly optimized algorithm pipeline to perform using combination of open source tool blocks and customized code
- Optimized algorithm for maximum performance on limited hardware platform
- Developed verification strategy to confirm recognition performance



## Proven Results

- Achieved image capture with camera in motion
- Achieved 100% accuracy for required verification image sets
- Met time-to-market goals to support the release of a next generation product
- New design provided new market opportunities and competitive advantage supporting client's revenue growth plans

# Consumer Device Internet of Things (IoT) Platform

Identified the most compelling IoT cases



## The Situation

A manufacturer of hot beverage brewing systems was facing intense pressure to add features and functionality that leverage the IoT. They need help identifying the most compelling features and functionality to appeal to new and existing customers.



## Challenges

- Identifying multiple connectivity, user interfaces, data transfer, capabilities, and scenarios to add to their product
- Determining the most beneficial IoT capabilities to build into the product
- Testing a wide variety of customer use cases



## Solution

- Designed and built a new test platform in 4 months
- System included multiple connectivity options, user interface methods, and data storage options
- Customized various use cases to set up specific trials for consumer testing



## Proven Results

- Able to identify the most compelling IoT use cases with new test platform
- Expanded use cases to gain detailed insights for specific product features
- Gained an understanding of how to productize IoT features

# Multi Location Data Collection

Advanced navigation software to avoid obstacles and adapt its path

## The Situation

A leading global consumer robot company with a mission of designing and building robots to use inside the home faced challenges with developing technologies in the areas of physical interactions, mapping and navigation. The company was looking for assistance in observing and documenting detailed usage information from the robot at a number of geographic locations, home styles, and settings across the US.



## Challenges

- Existing system reported errors when robot was stuck over an edge, on a threshold, or on a dark surface
- One or both of the side wheels could not turn, got stuck on obstacles, and uneven surfaces
- Robot would fail to return to the docking station when its run was completed or when it needed a charge
- Engineering team looking for substantial amounts of unique and unsystematic data to address customer complaints



## Solution

- Tested whether or not the robot camera could spot obstacles and features of households by completing numerous runs in different lighting configurations (on, off, dimmed, natural lighting, etc.)
- Mapping system was challenged by rearranging furniture and docking station between runs
- Geographic locations and a variety of home styles were specifically chosen to expose robot to unfamiliar floor plans



## Proven Results

- Provided extensive data for approximately sixty (60) different homes from twelve (12) different geographic locations
- Assisted in advancing navigation software to move effortlessly around obstacles, under furniture, and adapt its path
- Helped improved communication between robot and docking station
- Research supported the continued development of robots within a household