

Best Practices

Following the best practices and environmental considerations identified below will allow The Brain OS enabled scrubber to perform optimally

Teaching Routes

- Teach routes when the area is most clear of obstacles and people that may block the scrubber's path. This may require teaching routes outside of your normal cleaning times.
- If a route is taught in an area with obstructions that are later removed, the scrubber will not clean any areas previously occupied by those obstructions.
- When teaching a route make smooth wide turns, avoid narrow aisles, and do not drive in reverse. To run autonomously the scrubber needs 4 ft. of side-to-side clearance, 5 ft. of clearance for turns, and 10 ft. of clearance for U-turns.

Testing Routes

- Test all routes to ensure the unit can run them successfully. Monitor the scrubber during testing and note any areas of difficulty. The scrubber requires more space when running autonomously.
- If you notice the unit calling for many "assists" when testing your route, assess the environment and remove any obstructions. If the assists persist after obstructions are removed, the route you trained may include maneuvers that it cannot replicate autonomously. The best solution is to retrain the route.
- Environmental considerations are covered in detail starting on Page 3.

Running Routes Autonomously

- Preparing the environment during dust mopping is key to successful autonomous operation. It is essential to remove obstructions like boxes, new "moveable" features (e.g. end-caps), and to push back any protruding merchandise.
- Run routes when the area is most free of people and freight. Identify the best times to run different routes based on how the environment changes throughout your shift.

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- Visually inspect all sensors and wipe them down before starting an autonomous route. Dirty sensors can affect the machine's performance.
 - Pair your phone via the UI.
 - At the start of a route do not crowd the front of the machine. This may cause the scrubber to be unable to recognize her environment.
 - During the first 30 seconds of running an autonomous route, monitor the machine's side and rear squeegees to make sure they're properly adjusted. Pause the route and adjust the squeegees if necessary.

When to Teach New Routes

- If the environment changes significantly (e.g. remodeling, significant new features, obstructions, etc.) it may be necessary to teach a new route.
- A new route will be needed when the dimensions of the space have changed so much that the scrubber is having trouble navigating and is calling for frequent assists.
- Some common examples of changes that can necessitate new routes include:
 - New wing stacks added to the ends of aisles, narrowing the width of aisle entrances to less than 5 feet. Such aisles should then be excluded from autonomous routes.
 - New merchandise displays in the racetrack areas of retail stores, blocking its intended path.
 - Merchandise displays switched out, with new displays having different dimensions that the scrubber has trouble navigating.
- Also, if dimensions change revealing new floor space that was previously covered, new routes may be desired to include that area in an autonomous route.
- Common problematic obstacles and environmental features are covered in detail starting on Page 3.

Best Practices And Environmental Considerations By Application

Shopping Malls / Airports / Train Stations

Route Training Basics

- These sites tend to be large open spaces with few dynamic objects, so it's preferable to make long routes, making sure to avoid common problematic obstacles and water tank capacity.
- The water tank capacity is 29 gallons and it will run out faster on different settings.
 - Level 1 Approximate Duration: 3:40
 - Level 2 Approximate Duration: 1:40
 - Level 3 Approximate Duration: 1:01
 - Level 4 Approximate Duration: 0:44

Seasonal Decor

Seasonal displays for the holidays are often in areas that obstruct the robot's normal route path. This presents challenges with the robot's original mapped route which could lead to the robot having trouble localizing or navigating around potentially undetectable objects such as fake snow, signs or temporary carpet.

If the area is small and confined to a controlled and unchanging area, then cones may be used to prevent the robot from interfering with undetectable objects. Otherwise, we advise that new routes be created to accommodate the seasonal displays.



Retail Kiosks

Similar to the challenge with seasonal decor are when retail kiosks are added or removed from the environment. The robot may not be able to navigate around a new kiosk placed in its path, and it will not automatically adjust its routes to scrub areas previously occupied by kiosks that have been removed.

When autonomous routes are created, areas subject to frequently added or removed kiosks should be excluded from autonomous routes and instead be cleaned manually.



Food Court Seating Areas

Dynamic environments such as the food court below may not be best suited for autonomous cleaning. The tables and chairs move around and often there is not enough space for the machine to clean in between. It is possible where there is enough space, but it would require thorough preparation each night to ensure all the areas are clear and chairs pushed in.



Storefronts With Floor To Ceiling Windows

When the robot is scrubbing along the edge, such environmental features may cause the robot to perceive a false obstacle due to sensor interference and come to a stop.

When teaching an autonomous route keep 1-2 feet away from floor to ceiling windows to prevent such assists from occurring.



Circular Columns or Support Beams

The robot cannot navigate circularly around large support columns as is commonly done during manual scrubbing. Often the driver will make several circles around the beam. When this maneuver is replayed in autonomous mode, the robot detects its rear wheel is close to the column and calls for an assist.

You may want to avoid the columns or beams all together, however if the column is large enough to make wide turns around the structure, then the robot may navigate the area without issue. Test first.



Flat Objects

- Signs or umbrellas with flat bases
- Raised flooring
- All-weather entrance mats

The robot cannot detect these objects and will run them over in autonomous mode. If they appear in the robot's route, move them out of the way or retrain routes to avoid such objects.



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Construction Facades

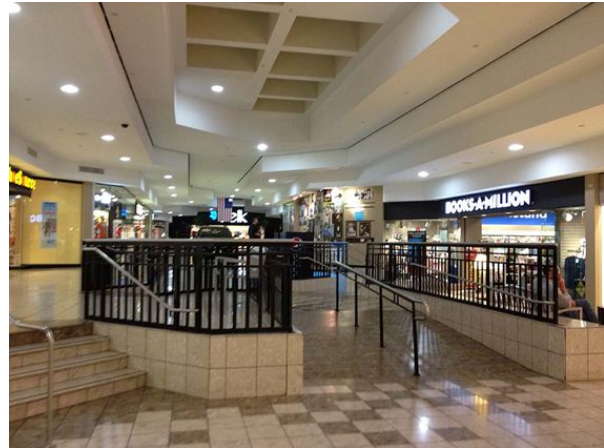
If added or removed from the environment, the robot may no longer recognize its environment and will come to a stop. If new or removed construction cause frequent problems, a new route should be created.



Ramps and Sloped Flooring

The robot cannot navigate up and down slopes. When making autonomous routes do not attempt to go up or down ramps and other sloped areas.

Sloped areas can serve as a natural barrier when segmenting a space between several different autonomous routes.



Uneven Flooring

Uneven flooring or areas with raised flooring less than 4 inches are undetectable by the robot's vision system. The scrubber may be able to drive over the uneven flooring manually but running autonomously can present issues with the robot's ability to see the depression or raised portion of the floor. If this happens while the robot is running autonomously, it may recognize the depressed area as a cliff and the raised area as a wall. Avoid uneven flooring while training routes keeping in mind that the robot sees the environment differently. You can place objects like cones or wet floor signs over the area you'd like the robot to avoid.



Leafy Plants

Plants can become problematic obstacles because they grow over time and their dimensions increase.

When creating routes leave a 2-foot buffer between the robot's autonomous path and leafy plants.



Vinyl Floor Stickers

These are flat objects and they cannot be seen by the scrubber. If they are fragile and may be damaged during floor scrubbing, exclude these from autonomous routes. If they are added to the environment it may be necessary to teach new routes for the scrubber.



Retail Stores (Grocery / Big Box / Hardware)

Route Training Basics

- During autonomous scrubbing the robot's environment is often shared with employees restocking shelves.
- Therefore route prep is vital: Before teaching or running a route, move boxes, pallets, shopping carts and similar items out of the robot's path.
- Segment the space and create multiple routes to account for other employees' workflow at the site.
- As much as possible, adjust other employees' workflow and habits to accommodate robotic floor scrubbing.
- Remember the following dimensional limitations when creating routes in a retail space.
 - Robot needs 4 feet of clearance to drive between objects.
 - Aisle entrances must be at least 5 feet wide for the robot to turn into while operating autonomously.
 - Robot needs 10 feet of clearance to make a U-turn.
- The water tank capacity is 29 gallons and it will run out faster on different settings.
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New Displays in Aisle Entrances

Added displays can reduce the width of an aisle entrance to less than 5 feet, making it impossible for the robot to turn into when operating autonomously.

Move such displays out of the way, or make new routes excluding those maneuvers that cause the robot to stop and call for an assist.



New Displays in Racetrack Aisles

Added displays can reduce the width between objects to less than 4 feet, making it impossible for the robot to pass.

Such displays should be moved, or new routes should be created to exclude areas that the robot can no longer navigate autonomously.



Displays Swapped Out

Sometimes merchandise displays will be swapped out, particularly in produce areas of grocery stores or in areas with seasonal merchandise. If the dimensions of the displays are greatly different, the scrubber may be unable to navigate the space without calling for excessive assists.

If navigation or cleaning coverage is compromised, teach a new autonomous route for that area.



Displays With Wheels

Be careful when creating autonomous routes in areas with wheeled shelving and displays. If the environment is already very tight, slight movements to wheeled displays can create spaces that are too tight for the scrubber to navigate. Exclude these areas from autonomous routes, and instead clean these areas manually.



Window Aisles (Hardware Stores)

Aisles filled with reflective surfaces like windows should be scrubbed manually. The robot's sensors will detect reflections near these objects that it senses as obstacles. This will cause the robot to come to a stop and call for an assist.



Overhanging Objects

If these objects appear in the robot's autonomous route, the robot may see these objects too late to navigate away from them and will call for an assist. Such objects should be avoided when creating autonomous routes.

Common Examples: **Clip Strips**, Signs, Protruding Merchandise, Clothing Racks, Bicycle Aisles, Leafy Plants



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