Title: Rollie Cart Purpose and Construction	Author(s): Jillian Conway, Bryce Schrier, Oscar Aguilera, Blake Sego,
Sub team/Function: Fabrication	Subject: Rollie Cart
Date/season: 18/19, submitted 1/7/19	White Paper #1

Team 3176 White Paper

Problem and Observations

Team 3176 Purple Precision team members and mentors faced the challenge of finding adequate storage space and quick, organized access to tools, supplies, and equipment with the temporary relocation of the Robotics Club to Brownsburg West Middle School PLTW Lab. Furthermore, during off-site competitions in previous years, team members carried supplies in milk crates, which proved inconvenient and labor-intensive. In addition, team members lost valuable work time locating the proper tools and supplies due to limited labelling space on tool carts. It was noted during the 2017-2018 FIRST district and state competitions that some Robotics teams utilized portable carts to store and carry tools and equipment for quick access and retrieval.

Solution and Purpose

Fabrication sub-team will build four standard, portable utility carts referred to as “rollie carts” to be used during off-season, build season, and at competitions. These carts can be modified and personalized to accommodate the storage, retrieval, and organization needs of each sub-team: Design & Fabrication (shared rollie cart), Electrical & Programming (shared rollie cart), Multi-Media, and Business.

Tools and Materials

- Plywood sheets (two sheets, each 2’ x 4’ per cart)
- Two-by-fours (four 48” Length; four 33” L; two 32” L, four 23” L)
- Four locking wheels
- Carpenter Tape Measure
- Writing utensil that can write well on wood, like a Sharpie
- Power Drill with Star and/or Phillips-head, depending on type of screws used
- Corresponding Star and/or Phillips-head screws
- ¾ drill bits (need enough to allow for potential breakage)
- Star and/or Philips head 3 ½” wood screws
- Circular saw
- Band saw
- Speed Square (rafter square/triangle square)
- Clamps (trigger and/or bar)

Design (See Photographs on last page)

The cart is made up of 2 large pieces of plywood shelves (upper and lower) framed and braced by two-by-fours in horizontal, vertical, and diagonal positions. Screws were set and drilled (power drill) ¾” in from the outside edge of the plywood and ¾” apart using the Speed Square for precise measurement. Each cart has 4 wheels for mobility that lock to keep cart in place and prevent shifting. Each wheel is attached by 3 screws aligned 3/4” inside the four corners on the lower plywood shelf. Lower shelf has outer lip (4” height, 2” depth) to contain items.

Construction Issues and Solutions

- Broken drill bits due to imprecise angled drilling
    - Solution: Apply steady pressure directly parallel to the bit. Let the tool do most of the work. Keep extra drill bits on hand.
- Splitting of wood during drilling
    - Solution: Use a Sharpie to mark the intended screw position and drill a pilot hole with a drill bit that is smaller than screw shank. Make sure hole is ¾" away from edge of wood to allow enough room in case wood shifts while drilling. Adjust the clutch of the power drill to a setting that drives the screw fully before the clutch releases.

Initial Testing of Functionality

Due to warped plywood, the initial standard rollie carts proved a bit wobbly and unstable. For example, not all the four wheels touched the ground while the carts were empty. However, upon testing with different weighted objects, the cart stabilized. NOTE: If building extra standard carts in the future, consider flattening plywood to level before using in construction.

Modifications

Each standard rollie cart can be modified to add the following features: peg board with hooks/shelves (for hanging tools, equipment), white boards (to communicate plans, sketch designs, explanations, etc.), additional shelving.