Coin Sorter
Alternate Challenge

1. **The Challenge:** Build an Autonomous Device (AD) capable of sorting five dollars of mixed pocket change into separate bins, each containing one kind of coin, within one minute. To qualify for tiers 1 and 3, the AD must successfully sort at least one coin of each denomination.

2. **Additional Specifications:**
   a. Each coin bin on the AD must be clearly marked with the denomination of the coins it will hold, and must allow access to coins for scoring.
   b. All coins must enter the AD through the same opening (Coin Opening).
   c. State Tournament: change may be loaded into a hopper prior to demonstration, poured into the device during demonstration or hand-fed during demonstration. The AD may be touched as required for hand feeding but not otherwise influenced, adjusted or controlled.
   d. National Tournament: change may only be loaded into a hopper prior to demonstration or poured into the AD during demonstration – no hand feeding.

3. **Variable Parameters:**
   a. The number of each type of coin will be determined by the judges such that the total value equals five dollars.
   b. Only quarters, dimes, nickels, and pennies will be used.

4. **Supplied Materials:** Five dollars in mixed pocket change.

5. **Mystery Material:** Yes. At the National Tournament only there may be more than one.

6. **Prohibited Materials:** Commercial coin sorting machines, components of commercial coin sorting machines.

7. **Construction Time:** 30-45 min. (exact time announced prior to competition or during Final Instructions).

8. **Demonstration:**
   a. The AD may be turned on prior to demonstration.
   b. Students will have one minute to feed and sort as much of the change as possible using their AD.
   c. Change may not be sorted prior to loading, pouring or feeding.
   d. If coins are preloaded, timing will start when the AD is activated. Otherwise timing begins when the first coin is fed. If finished before one minute has elapsed, students must shout "Stop" to gain bonus seconds.
   e. At the end of 60.0 seconds all sorting must stop and no more coins may enter the coin containers.
   f. To qualify for tiers 1 and 3, students must demonstrate to the judges that their AD actually sorts coins and all locations or containers for each denomination of coins must be clearly labeled prior to the end of construction.

9. **Scoring:**
   a. Total Value = Total value in cents of all change accurately sorted.
   b. Height = Distance between the lowest point of the Coin Opening and the surface on which the AD rests, rounded to the nearest cm
   c. Length = Longest horizontal dimension of the AD in centimeters, rounded to the nearest cm
   d. Bonus Seconds = Seconds remaining on the 60 second timer, rounded up to whole seconds.
   e. Tiers 1 & 3: $\frac{[(100 - |Height – 100|) \times Total Value]}{50}$ + Bonus Seconds (high score wins)
   f. Ties broken by Bonus Seconds, then by Length
   g. Tiers 2 & 4: Ranked by Height, then by Length. (high score wins)
   h. Ties Broken by Height, then Length
   i. Each touch will result in a 10% score penalty per touch.