Autonomous Maze *(CEENBoT Carnival K.A.R.T.)*: GPI, TI, or API

Objective: Autonomous programming of the CEENBoT. The CEENBoT has to ensure the safety of carnival attendees by clearing the carnival of "klowns" and/or reuniting children with their parents – *Carnival Klown Alert Response Team (K.A.R.T.).*

Rules

1. All course challenges must be completed in <u>five minutes</u> for full credit.
2. Participants may modify ("engineer") their CEENBoT to meet the objective.
3. Participants will be given the exact dimensions of the course and their respective challenge prior to the event so that their CEENBoT can be programmed to complete the specific challenge (see Figure 1).
4. The CEENBoT must begin within one of the stations for each challenge (see Figure 1).
5. All three CEENBoT wheels and challenge objects (see Note 1) must remain within the outer boundary of the challenge space (see Figure 1).
6. Participants will be allowed to restart the course as many times as they can during the allotted time.
7. The best score and fastest time will be used for final scoring and ranking.
8. All wheels must remain in contact with the ground (Judges' discretion).
9. Once the CEENBoT begins a challenge ("response"), it should not be touched
10. If the participant chooses to affect the CEENBoT for a slight route adjustment, the student must first inform the judge of the adjustment.
11. For each adjustment, the following penalties will be enforced:
    - 1st course adjustment - 20 sec. penalty
    - 2nd course adjustment - 30 sec. penalty
    - 3rd course adjustment – Start over (without time stoppage)

12. Only if due to a "start over" and the participants' choice to "scratch" the challenge attempt, the participants will have the opportunity to complete the challenge *after all teams have had the opportunity to complete their respective challenges.* This depends on if time permits in the competition portion of the Nebraska Robotics Expo.

Note 1: "Challenge objects" (i.e., "children", "parents", and "klowns") will be constructed of two ¾" PVC plugs and one ¾" PVC coupling (FPTxFPT) and filled with sand. The plugs will be screwed into the ends of the coupling. "Challenge objects" will be clearly marked, standing on end (vertically), and centered in each designated square's coordinates (see Figure 1). "Tents" will be constructed of standard construction paper to the exact dimensions of each designated square's coordinates (see Figure 1). The event course's boundary and designated squares will be outlined. <u>Gridlines will not be provided on event course.</u>

Figure 1. CEENBoT Carnival K.A.R.T. (one course, 10' x 10' area (1' x 1' spacing))
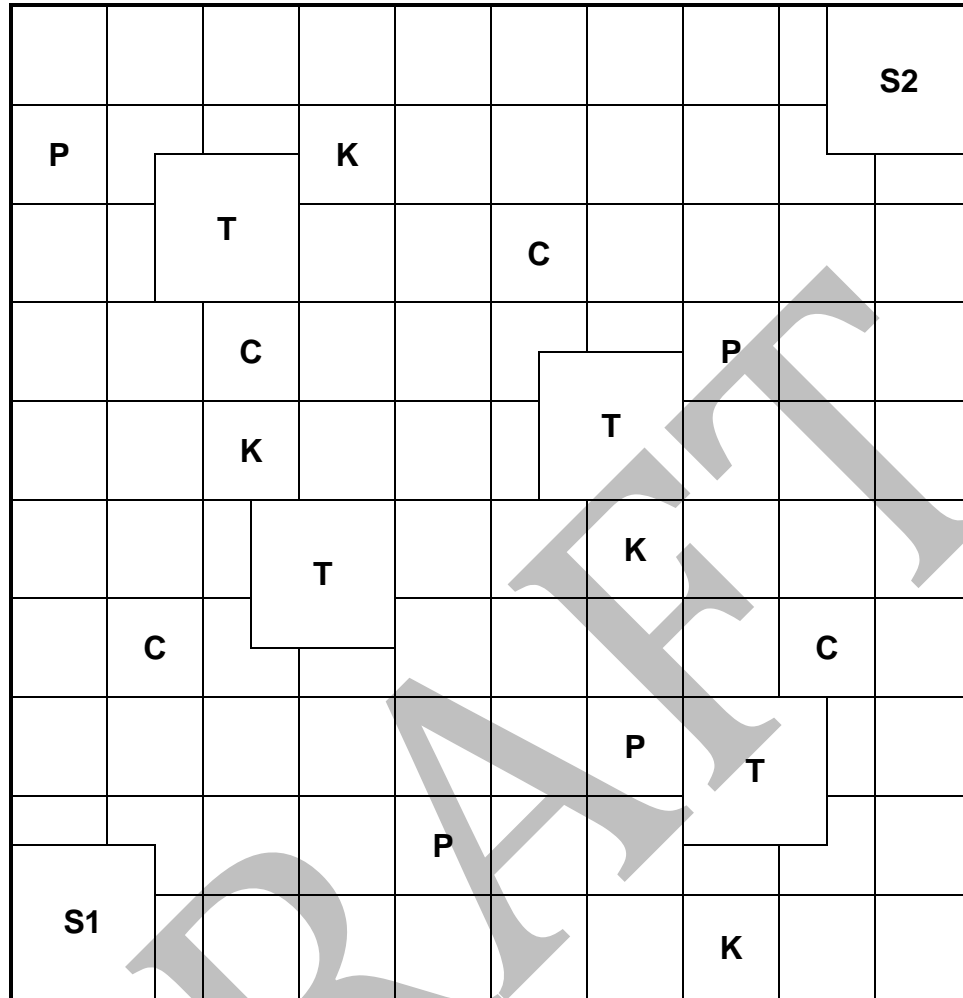
Legend (See Note 1)
K – Klown   T – Tent
C – Child   S1 – Station #1
P – Parent   S2 – Station #2

Klown Containment (Elementary Level):

1. This challenge requires precision completion of containing "klowns" on the carnival grounds in stations (see Figure 1).
2. The CEENBoT must remove each "klown" from the carnival grounds by moving them into Station #1 and Station #2 (containment), alternately.
   a. The CEENBoT may start from either station (i.e., S1 or S2).
   b. Upon contact with a "klown" (K), the CEENBoT must move it to the alternate station without touching any child (C), parent (P), or tent (T). For example, if the CEENBoT starts at S1, the "klown(s)" must be delivered to S2 for that program. Then, the CEENBoT must start from S2 to remove another "klown(s)" to S1. This alternate start location must be repeated until all "klowns" are removed from the carnival grounds. (See Note 2)

NOTE 2: CEENBoT Commander can store up to eight (8) programs. Consider using a delay command upon arriving at the alternate station.

3. The "klowns" must be removed from the carnival grounds by being "contained" within a station's square area, see Figure 1.
4. Five (5) points will be awarded for each "klown" successfully "contained" in a station.
5. The clock will pause once the "klown(s)" is "contained" in a station. The CEENBoT can be prepared for the subsequent program and the clock will resume upon the start of the program. Final time will be the time necessary to complete the challenge, if less than five minutes (5 min.).
6. *A Bonus five (5) points will be awarded for containing all "klowns" on the carnival grounds in the stations within the allotted five minutes.*
7. *One (1) point will be deducted for each contact with a child (C), parent (P), or tent (T).*
8. Scoring is based on total points, as well as time to contain "klowns" in the stations.
9. Total points determine the leader, with the fastest completion time determining ranking and tiebreakers.

Family Reunion (Middle Level):

1. This challenge requires precision completion of reuniting children (C) to parents (P) (see Figure 1).
2. **Students will have to engineer an apparatus to protect and reunite the child (C) to a parent (P) using a servo motor.**
3. The CEENBoT must reunite each child (C) to a parent (P) on the carnival grounds.
    a. The CEENBoT must reunite each child (C) to a parent (P) without touching another child (C), a parent (P), tent (T), or "klown" (K).
    b. Upon a reunion, the CEENBoT must return and stop within the station's square area from which it started.
    c. Then, the CEENBoT must start from the alternate station for the next reunion attempt.
    d. This alternate start must be repeated until all reunions have occurred on the carnival grounds. (See Note 2)

    NOTE 2: CEENBoT Commander can store up to eight (8) programs. Consider using a delay command upon arriving at the alternate station.

4. A reunion occurs when the child (C) is placed within the parent's square area, see Figure 1.
5. Five (5) points will be awarded for each successful reunion.
6. The clock will pause once the CEENBoT returns and stops within the station's square area from which it started. The CEENBoT can be prepared for the subsequent program and the clock will resume upon the start of the program. Final time will be the time necessary to complete the challenge, if less than five minutes (5 min.).

7. *A Bonus five (5) points will be awarded for reuniting all children (C) with a parent (P) within the allotted five minutes.*
8. *A one (1) point deduction will be assessed for each contact with another child (C), parent (P), tent (T), or "klown" (K).*
9. Scoring is based on total points, as well as time to reunite children (C) to a parent (P).
10. Total points determine the leader, with the fastest completion time determining ranking and tiebreakers.

Dart K.A.R.T. (High School Level):

1. This challenge requires precision completion of containing "klowns" on the carnival grounds and reuniting children (C) to parents (P) (see Figure 1).
2. **Students will have to engineer an apparatus to protect and reunite the child (C) to a parent (P) and contain the "klown" (K) using servo motors. The child and "klown" cannot be in the same apparatus simultaneously.**
3. The CEENBoT must reunite each child (C) to a parent (P) on the carnival grounds and contain "klowns" in a station.
   a. The CEENBoT must reunite each child (C) to a parent (P) without touching another child (C), a parent (P), tent (T), or "klown" (K) (*unless it is a programmed attempt to contain the "klown" (K)).*
   b. Upon a reunion, the CEENBoT must return and stop within the station's square area from which it started, and deliver any "klowns" (K) for containment.
   c. Then, the CEENBoT must start from the alternate station for the next reunion and "klown" (K) containment attempts.
   d. This alternate start must be repeated until all reunions have occurred on the carnival grounds. (See Note 2)

   NOTE 2: CEENBoT Commander can store up to eight (8) programs. Consider using a delay command upon arriving at the alternate station.

4. A reunion occurs when the child (C) is placed within the parent's square area, see Figure 1.
5. Five (5) points will be awarded for each successful reunion.
6. The clock will pause once the CEENBoT returns and stops within the station's square area from which it started. The CEENBoT can be prepared for the subsequent program and the clock will resume upon the start of the program. Final time will be the time necessary to complete the challenge, if less than five minutes (5 min.).
7. *A Bonus five (5) points will be awarded for reuniting all children (C) with a parent (P), and/or containing all "klowns" (K), within the allotted five minutes.*
8. *A one (1) point deduction will be assessed for each contact with another child (C), parent (P), tent (T), or "klown" (K).*
9. Scoring is based on total points, as well as time to reunite children (C) to a parent (P) and to contain "klowns" in stations.
10. Total points determine the leader, with the fastest completion time determining ranking and tiebreakers.