FRC 4523 Scouting Tool Design Proprosal

Introduction

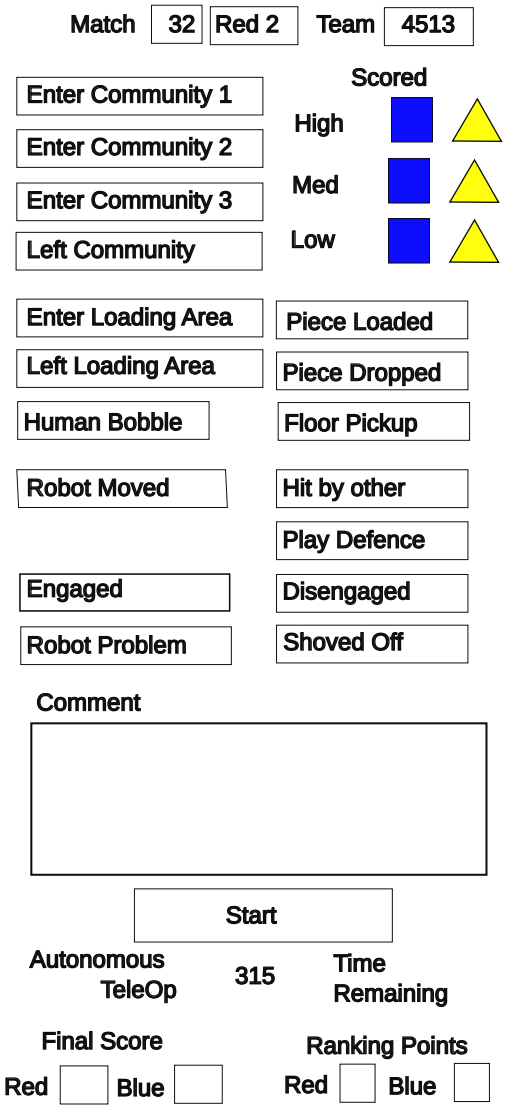
This paper proposes tools for scouting other teams and discovering information about teams hidden by a simple score and missed by informal scouting. This allows for statistical analysis of teams (analytics) to do better alliance selection and to make more improvements to one's own robot.

The Problem to be Solved

The scouting reports generally are qualitative and subjective. The scouts use terms like fast, quick, sluggish and some times "best team ever." They may reported "cube specialist." This sort of scouting reports does not lend itself to ranking to teams to find the quickest or most sluggish or to find which teams are the best cube specialist. A further problem is that each scout uses their own language to describe things and may include typos. This prevents automated processing of the reports.

Proposal

The proposal is to have an app that runs on a phone or its browser that reports time-stamped events that occur during a match. These reports can be analyzed after the match to generate statisics about the performance of the robot and its team.



Operation

The following sections describe the operation of the scouting app. This is based on the 2023 game and will of course change for the 2024 season, but the principle operation will be the same. All buttons will be visible at at times, but buttons that don't apply to a particular mode will be grayed out and not accepted.

Prematch

Before the match the app is prepared by selecting the match number, the alliance, (the alliance driver station position) and the team number. It is envisioned that the app will preload a JSON file containing information about all of the matches, so that the user need only enter a match number or click on it to increment to the next match to bring up the six teams for that match. For a scout already assigned to the second red team, the second red team would be preselected.

Autonomous

The app has a built in timer to time-stamp the events. This clock is synchonized manually by the scout when the announcer counts down at the start of the event. The scout then presses buttons to record the following events:

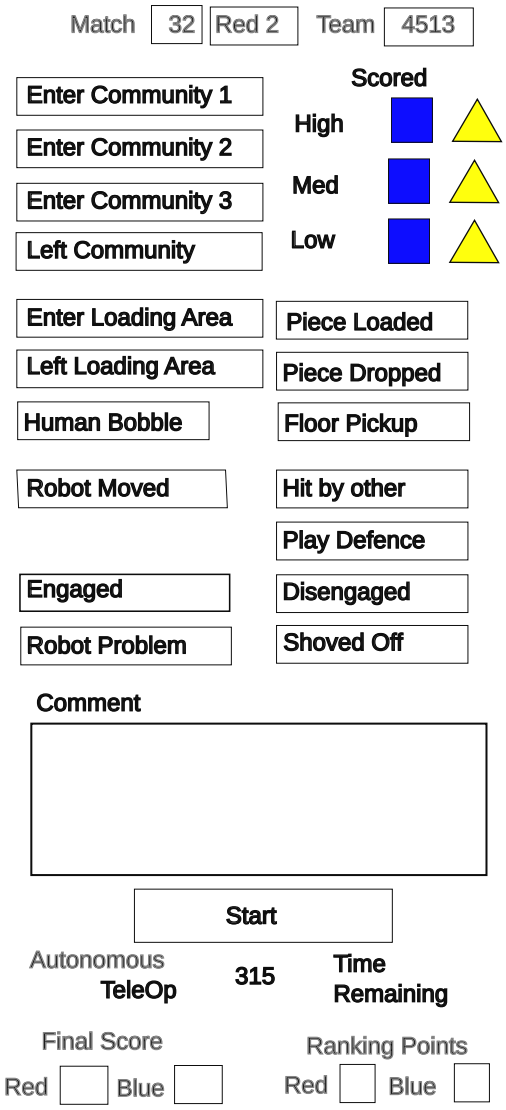
- team was no show
- robot moved
- scored cube or cone on a certain level
- picked up game piece from floor
- engaged with the charging station
- left the community

TeleOp

When the autonomous period ends, the app will automatically switch to the autonomous period and more buttons will be revealed. The scout presses buttons to the following record events as they occur:

- robot moved (to time how long it takes drive team to reach controls and move the robot and to report recovery from robot problem)
- robot left community
- robot entered loading area
- congestion
- game piece loaded
- game piece dropped
- game piece picked off floor
- human bungled game piece
- robot left loading area
- robot entered community via certain lane
- scored cube or cone on a certain level

- robot problems via a pop up list including:
  - robot not moving
  - robot pickup malfunction
  - robot arm malfunction
  - robob elevator malfunction
  - robot bumper loose
  - team no show
  - team forfeit (showed up but not competing)
  - lost communication
  - lost power
  - tipped over
  - robot fouled
  - disqualified
  - disabled by referee



Post Match

After the match is over. The scout can enter observations and comments about the robot and the match. Problems like disqualification, yellow card and red card can also be entered The scout can enter the final score and ranking points earned by each alliance. The report is closed and sent to the server.

App Report

The report from the app to the server has two basic parts:

- Information about the match and robot being scouted.
- Information about events during the match for the scouted robot

This information is passed as a text based JSON file to make it easy to generate by the app and easy to process by the server. An example of such a file is as follows:

```
{
    "match": 32,
    "alliance": "red",
    "position": 2,
    "team": 4513,
```

```
    "event":{
        "period": "pre",
        "comment": "robot has high profile"
    },
    "start time": "14:05",
    "event":{
        "period": "auto",
        "time": 25,
        "type": "robot moved"
    },
    "event":{
        "period": "auto",
        "time": 27,
        "type": "cube scored high"
    },
    "event":{
        "period": "auto",
        "time": 16,
        "type": "robot left community"
    },
    "event":{
        "period": "teleop",
        "time": 133,
        "type": "robot moved"
    },
    "event":{
        "period": "teleop",
        "time": 125,
        "type": "robot fouled"
    },
    "event":{
        "period": "teleop",
        "time": 127,
        "comment": "robot just lost it"
    },
    "event":{
        "period": "post",
        "type": "yellow card"
    },
    "event":{
        "period": "post",
        "comment": "red team was lucky"
    },
    "score": {
        "red": 96,
        "blue": 95,
        "red ranking points": 4,
        "blue ranking points": 2
    },
}
```

Server Storage and Processing

The server processes the report and generates a set of statistics for the robot in this match and in this competition. This should be in a spreadsheet format to allow realtime analysis. It should include information like:

- engaged autonomous
- engaged teleOp
- cones scored total, high, medium, low
- cubes scored total, high, medium, low
- points scored autonomous
- raw points scored teleop (links are unknown by scout)
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- time to drive station
- number of cycles (score to pickup to score)
- fastest full cycle time (no floor pickup)
- fastest cycle time (may have floor pickup)
- average cycle time
- slowest cycle time
- fastest pickup time
- average pickup time
- slowest pickup time
- fastest scoring time
- average scoring time
- slowest scoring time
- fastest field traverse time
- average field traverse time
- slowest field traverse time
- percent of time traversing
- percent of time picking up
- percent of time scoring
- times engaged in defense
- robot breakdown (with power and comm)
- robot lost power
- robot lost communication
- robot disabled by referee
- red card
- yellow card
- comments