Minutes of Monthly Webinar No. 2:

INFORMS RAS · 2020 Problem-Solving Competition

April 24, 2020 · 10:00 AM EDT

RAS Attendance:

Krishna Jha (Host / Problem Owner) · Jay Baillargeon (Problem-Solving Competition Chair)

Agenda:

- Welcome
- Open Forum for Participants' Q&A
- Adjourn (Next Monthly Webinar: **Friday, May 15, 2020**)

Conference Call / Zoom Webinar:

- Jay Baillargeon and Krishna Jha welcomed those who attended the second monthly webinar for the 2020 INFORMS RAS Problem-Solving Competition and re-iterated that the goal of the webinar is to provide an open forum to gather feedback for the problem at hand from the RAS community as well as address questions from participants.
- Mr. Baillargeon also noted that the Toy Problem dataset has been uploaded to the INFORMS RAS Problem-Solving Competition website, just in case there were participants on the webinar who may have been previously unaware of this.
- Mr. Jha added that the Toy Problem dataset is not for validation; rather, the purpose is to understand the type of problem represented by the problem statement in terms of the network, operating conditions, etc., as well as help complement algorithms currently being developed by participants since the Toy Problem is small enough to be solved by hand.
- Following Mr. Jha's discussion of the Toy Problem dataset, Mr. Baillargeon opened the forum for questions, comments, and any discussion related to the draft problem statement as posted on the website. This brought about the following questions:
    - **Explain the network diagram that was provided with the Toy Problem dataset? What are the distances listed in the diagram?**
        - Mr. Baillargeon noted that the network diagram represents one subdivision and is modeled after the track charts freight railroads typically use to represent different segments or divisions of their entire network.
        - Mr. Jha added that, while the Toy Problem dataset uses one subdivision, the validation dataset that will be released in May will be comprised of multiple subdivisions and, as such, will likely not be linear like the Toy Problem as it will branch off into other mainline tracks.
        - To answer the follow-up question, Mr. Baillargeon noted that the distances (depending on whether they are above or below the network) represent the distances between the stations (i.e., below the network) or the distances between important points in the network, such as sidings or spurs, that will be useful to the participant (i.e., above the network).

- **Is there siding accessibility from both of the mainline tracks shown in the network diagram?**
    - Mr. Baillargeon and Mr. Jha pointed out that, in the network diagram, not all sidings are immediately accessible from both mainlines.
    - They pointed out that there are multiple crossovers in the diagram, which are denoted by slanted lines between the two mainline tracks. At these points, a train can cross over to the other mainline which will allow for access to the sidings if near the entrance to the siding.
    - Although, it was also noted that there are a couple sidings which are only accessible from one of the mainline tracks, in which case a train traveling on the opposite track must use a crossover at some point to be able to access it.
- **How long does it take for a train to accelerate or decelerate for this problem?**
    - Mr. Jha replied that the acceleration/deceleration of a train for this problem should be instantaneous to avoid unnecessary complexity.
- **What is the headway distance to maintain?**
    - In response, Mr. Jha noted that you can assume that the headway concept does not apply for the Toy Problem; one can assume that only one train can occupy a section of track between two points within the given network diagram.
    - A follow-up question asked, **"Should we assume only freight trains in this problem, or are passenger trains included as well?"** In response, Mr. Baillargeon noted that, at this point in time, only freight trains will be considered to avoid unnecessary complexity in the problem.
- **The Toy Problem data set states "First Come, First Serve" (FCFS), but it's not necessarily FCFS, correct?**
    - Mr. Baillargeon noted that this was in reference to the switch orientation at crossovers or sidings.
    - He added that by stating FCFS as an assumption for the switch orientation, it was intended to relay to the participants that the switch orientation can be ignored; it is assumed that the switch will be aligned as needed for any of the trains operating in this problem.
- **If a train arrives early to a station, does it have to wait for the planned departure time?**
    - Mr. Jha stated that the train is to wait until the intended departure time, even if it arrives early.
- **Will the lognormal assumption for the random variables in the problem be maintained, even for the validation dataset?**
    - Mr. Baillargeon noted that, as railroads do not record data on the availability of crews, locomotive, or yards, these variables will continue to follow a lognormal distribution unless otherwise noted.
    - A follow-up question asked, **"Will the format of the data remain the same?"** In response, Mr. Baillargeon stated that the validation dataset will be presented in the same format as the Toy Problem dataset.

- **While the actual arrival and departure times for the Toy Problem dataset are blank, will this information be provided in the validation dataset to come later?**
    - Mr. Jha noted that this data will be provided in the validation dataset.
- **There is a variable called "RPTG_STN_FLG" (i.e., Reporting Station Flag), where Y is given if the station is in the list of important stations, and N otherwise. In the dataset, this column is missing. What makes it different if it's an important station?**
    - Mr. Jha noted that only important stations will be given in the network diagrams, including the diagram to be provided in the validation dataset.
    - Mr. Baillargeon added that the definition should've been removed from the list and was simply an overlooked error in the Toy Problem dataset. As such, it should be ignored as only important stations will be included, as Mr. Jha noted.
- **Is the STATION_TO for the last train intentionally blank?**
    - Mr. Jha replied that this is intentionally blank because the station is the final destination for the train.
- **As stated in the random variables, CREW_AVAIL is considered for Station C only, right?**
    - Mr. Jha confirmed that this is correct; CREW_AVAIL is only considered for Station C in the Toy Problem dataset.
- **The trains in the Toy Problem dataset have multiple locomotives, so does that mean there are differences in speed?**
    - Mr. Jha responded that the multiple locomotives are provided based on the tonnage and priority of the trains, but there is no change in the speeds; the permissible speed of a train at any given point within the network is given in the diagram.
- **The example data set implicitly assumes the intermediate segments, which you can do for a linear network. Will the final dataset define the segment path a train must follow or is this something for which we must determine?**
    - Mr. Jha noted that the paths of the trains travelling within the network will be given with the validation dataset; participants will not have to determine the path of the train through the network.
- **Are the distributions of the random variables what participants are supposed to use, or simply a recommendation? And will this information be given for all the important stations in the larger dataset?**
    - Mr. Jha noted that the distributions provided are required, as data is not available for these variables.
    - He also stated that Problem-Solving Competition committee will provide the distributions for any of the random variables present, but they will be given based on the type of activity, rather than for specific stations.
    - Mr. Baillargeon clarified that the station may be designated as a point at which a crew change is made, but it will follow the same distribution for CREW_AVAIL as any other stations designated as a point at which a crew change is made.
- **Will the training network be the same as the testing network?**
    - Mr. Baillargeon responded, stating that the network for the validation dataset will be larger and encompass multiple subdivisions of varying length.

        - A follow-up question asked, **"It's a different network? Independently, or this will be part of a larger network?"** In response, Mr. Jha stated that network will likely be entirely different than the one provided in the Toy Problem.
    - **What determines the amount of time needed to get a train on a siding or spur?**
        - Mr. Jha responded by stating that participants are to assume that the transition is instantaneous once the siding is reached as there is no intention on providing times based on train lengths due to the added complexity this would cause.
        - In response to a follow-up question regarding the train speeds into sidings, Mr. Baillargeon noted that the third line of the speeds provided in the network diagram summarize speeds within the sidings and industrial spurs.
- Mr. Jha posed a question to those attending the webinar, inquiring as to the general feelings about the problem, namely whether it is interesting, or if there is anything that can be done to make it more interesting. The following summarize the responses made to his inquiry:
    - "Yes, definitely fun. Still figuring out the train related stuff, but yes fun."
    - "I'm just afraid that as I'm not an expert in railway domain, I might be missing some constraints that might be obvious in reality."
        - Mr. Jha and Mr. Baillargeon assured the group that they would be happy to explain anything that appears ambiguous from an operations perspective, either in these webinars or separately via email (railwayapplicationssection@gmail.com).
        - Mr. Baillargeon also added that any questions that are considered important for the other participants to know the answer to will be posted on the website as well.
    - "This is an interesting and valuable topic, and it's a pretty good chance to learn about the railway domain."

Action Items:

- In response to a request made during the webinar, the Problem-Solving Committee will provide information that elaborates on the siding and spur rules via the website so participants can properly model it.