Mittuniversitetet
MID SWEDEN UNIVERSITY

PROJEKT
Trains

Objektorienterad programmering i C++ (DT060G) VT 2017 v1.2

Uppgiften består i att under en dag för ett järnvägsbolags räkning simulera trafiken i deras järnvägsnät. Simulationen ska implementeras i ett objektorienterat system. Tiden ska kunna stegas fram, antingen i tidsintervall användaren bestämt, eller händelse för händelse.

Innan simuleringen startar kan användaren välja start- och sluttid . Endast de tåg som avgår mellan dessa tider ska loggas, men ett tåg som avgått ska få avsluta sin resa innan programmet avslutas.

När simuleringen avslutas visas en summering av resultatet innan programmet avslutas.

Förslag till programmenyn

Start menu
1. Change start time [00:00]
2. Change end time [23:59]
3. Start simulaton
0. Exit

Obs!
Alla händelser i simuleringen ska köras för at resultatet ska bli korrekt men de behöver inte synas om man väljer andra start/sluttider. Start- och sluttider handlar bara om vad som ska hanteras av, och synas för användaren.

Option > 3 (Start simulaton**)**
Simulation menu : current time [00:00]
1. Change interval [00:10]
2. Run next interval
3. Next event
4. Finish
5. Change log level [Low]
6. Train menu
7. Station menu
8. Vehicle menu
0. Return

Option > 2 (Run next interval**)** *current time [00:40]*

00:42 Train [50] (ASSEMBLED) from Dunedin 01:12 (01:12) to GrandCentral 02:05 (02:05) delay (00:00) speed = 0 km/h
is now assembled, arriving at the platform at 01:02

00:44 Train [17] (ASSEMBLED) from Liege-Guillemins 01:14 (01:14) to GrandCentral 02:37 (02:37) delay (00:00) speed = 0 km/h
is now assembled, arriving at the platform at 01:04

00:44 Train [115] (ASSEMBLED) from Hauptbahnhof 01:14 (01:14) to GrandCentral 02:17 (02:17) delay (00:00) speed = 0 km/h
is now assembled, arriving at the platform at 01:04

00:46 Train [1] (ASSEMBLED) from GrandCentral 01:16 (01:16) to Liege-Guillemins 02:46 (02:46) delay (00:00) speed = 0 km/h
is now assembled, arriving at the platform at 01:06

00:46 Train [34] (ASSEMBLED) from ST.Pancras 01:16 (01:16) to GrandCentral 02:30 (02:30) delay (00:00) speed = 0 km/h
is now assembled, arriving at the platform at 01:06

00:47 Train [99] (ASSEMBLED) from Shinjuku 01:17 (01:17) to GrandCentral 01:57 (01:57) delay (00:00) speed = 0 km/h
is now assembled, arriving at the platform at 01:07

Simulation menu : current time [00:50]

Option > 3 (Next event**)**
00:51 Train [67] (ASSEMBLED) from MilanoCentrale 01:21 (01:21) to GrandCentral 01:48 (01:48) delay (00:00) speed = 0 km/h
is now assembled, arriving at the platform at 01:11

Option > 4 (Finish**)**

00:42 Train [50] (ASSEMBLED) from Dunedin 01:12 (01:12) to GrandCentral 02:05 (02:05) delay (00:00) speed = 0 km/h is now assembled, arriving at the platform at 01:02

00:44 Train [17] (ASSEMBLED) from Liege-Guillemins 01:14 (01:14) to GrandCentral 02:37 (02:37) delay (00:00) speed = 0 km/h is now assembled, arriving at the platform at 01:04

00:44 Train [115] (ASSEMBLED) from Hauptbahnhof 01:14 (01:14) to GrandCentral 02:17 (02:17) delay (00:00) speed = 0 km/h is now assembled, arriving at the platform at 01:04

00:46 Train [1] (ASSEMBLED) from GrandCentral 01:16 (01:16) to Liege-Guillemins 02:46 (02:46) delay (00:00) speed = 0 km/h is now assembled, arriving at the platform at 01:06

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1:00:59 Train [32] (FINISHED) from Liege-Guillemins 21:40 (23:50) to ST.Pancras 22:52 (1:00:39) delay (01:47) speed = 199 km/h is now disassembled.

Simulation menu : current time [1:00:59]
1. Change log level [Low]
2. Print statistics
3. Train menu
4. Station menu
5. Vehicle menu
0. Return

Option > 1
    Log level menu
    1. Low log level
    2. Normal log level
    3. High log level
    0. Return

Option > 2 (Print statistics)

Number of vehicles at start of simulation:
GrandCentral = 102
Liege-Guillemins = 87
ST.Pancras = 83
Dunedin = 101
MilanoCentrale = 108
Luz = 77
Shinjuku = 79
Hauptbahnhof = 104

Result at end of simulation:
Total delay time = 14h 30min
End time for simulation = 01:22

Trains that never left the station (5):
Train [81] from MilanoCentrale 20:36 (00:36) to GrandCentral 21:02 (01:02)
    Vehicles:
        [Electric locomotive] id: 70, max speed: 224 km/h, power 4955 kw.
        [Covered goods wagon] id: 451, Cargo volume 118 m^3.
    Missing vehicles:
        Covered goods wagon
        Covered goods wagon

Train [82] from MilanoCentrale 21:52 (00:32) to Liege-Guillemins 23:07 (01:47)
    Vehicles:

[Electric locomotive] id: 71, max speed: 217 km/h, power 4913 kw.
[Diesel locomotive] id: 265, max speed: 228 km/h, fuel consumption: 553 l/h.
Missing vehicles:
Covered goods wagon
Covered goods wagon
Covered goods wagon

Train [96] from Luz 20:01 (00:31) to Hauptbahnhof 20:38 (01:08)
Vehicles:
[Diesel locomotive] id: 89, max speed: 231 km/h, fuel consumption: 610 l/h.
[Open goods wagon] id: 222, cargo capacity: 66 ton, cargo area 30 m^2.
[Open goods wagon] id: 223, cargo capacity: 62 ton, cargo area 32 m^2.
Missing vehicles:
Open goods wagon

Train [97] from Luz 21:15 (00:35) to GrandCentral 22:36 (01:56)
Vehicles:
[Electric locomotive] id: 72, max speed: 220 km/h, power 4714 kw.
Missing vehicles:
Open goods wagon
Open goods wagon
Open goods wagon

Train [124] from Hauptbahnhof 13:18 (00:38) to ST.Pancras 14:55 (02:15)
Vehicles:
[Diesel locomotive] id: 181, max speed: 228 km/h, fuel consumption: 643 l/h.
[Passenger car] id: 2, 95 seats, internet onboard.
[Passenger car] id: 3, 83 seats, no internet onboard.
Missing vehicles:
Passenger car

Delayed trains (6):
Train [32] from Liege-Guillemins 21:40 (23:50) to ST.Pancras 22:52 (01:02)
Train [87] from Luz 07:21 (07:51) to MilanoCentrale 08:39 (09:09)
Train [91] from Luz 12:48 (17:38) to Liege-Guillemins 13:00 (17:50)
Train [94] from Luz 17:03 (17:13) to MilanoCentrale 18:19 (18:29)
Train [121] from Hauptbahnhof 09:11 (11:41) to Shinjuku 09:42 (12:12)
Train [127] from Hauptbahnhof 17:16 (21:36) to Luz 17:54 (22:14)

Obs!

- För betyget A kommer resultatet av simuleringen att se annorlunda ut.
- För betyget C (och även D och E) ska simuleringen visa att 9 tåg aldrig lämnade sina avgångsstation eftersom de blev kvar i tillståndet INCOMPLETE

  Tågen: 32, 81, 82, 87, 91, 94, 97, 121 och 127

Option > 3

Train menu

1. Search train by number
2. Search train by vehicle id
3. *Show all trains*
4. Change log level [Low]
0. Return

Option > 4

Station menu

1. *Show station names*
2. show station by name
3. *Show all stations*
4. Change log level [Low]
0. Return

Option > 5

Vehicle menu

1. Show vehicle by id
2. *Show all vehicles*
3. Change log level [Low]
0. Return

Tips: Diskret händelsestyrd simulering

Uppgiften lämpar sig väl för ”Discrete Event-Driven Simulation” där alla händelser sker vid diskreta tidpunkter och tiden däremellan kan ”hoppas över”. Ett enkelt ramverk för detta som du kan utnyttja om du vill finns i filen Exempel-DEDS.zip.

Lycka till!
Awais