Solution 4: Object creation and logic

ETH Zurich

1 Creating objects in Traffic

Listing 1: Class *OBJECT_CREATION*

<table>
<thead>
<tr>
<th>note</th>
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<tbody>
<tr>
<td>description: &quot;Creating new objects for Zurich.&quot;</td>
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</table>

class *OBJECT_CREATION*

inherit *ZURICH_OBJECTS*

feature -- Explore Zurich

explore

-- Create new objects for Zurich.
do
add_buildings
add_route
-- check out add_route_2 as an alternativeend

add_buildings
-- Add ETH main building and Opera house to Zurich.
local
corner_a, corner_b: VECTOR

eth, opera: BUILDING
do
create corner_a.make (250, −20)
create corner_b.make (300, −100)
create eth.make ("Raemistrasse 101", corner_a, corner_b)
eth.set_name ("ETH")
Zurich.add_building (eth)
create corner_a.make (200, −1400)
create corner_b.make (260, −1480)
create opera.make ("Schillerstrasse 1", corner_a, corner_b)
opera.set_name ("Opera")
Zurich.add_building (opera)end

add_route
-- Add a route from Polyterrasse to Opernhaus through Paradeplatz to Zurich.
local
  leg1, leg2, leg3: LEG
  opera_route: ROUTE
do
  create leg1.make (Zurich.station ("Polyterrasse"), Zurich.station ("Central"),
          Zurich.line (24))
  create leg2.make (Zurich.station ("Central"), Zurich.station ("Paradeplatz"),
          Zurich.line (7))
  create leg3.make (Zurich.station ("Paradeplatz"), Zurich.station ("Opernhaus"),
          Zurich.line (2))
  leg1.link (leg2)
  leg2.link (leg3)
  create opera_route.make (leg1)
  Zurich.add_route (opera_route)
end

add_route_2
  --- Add a route from Polyterrasse to Opernhaus through Paradeplatz to Zurich (alternative solution).
local
  opera_route: ROUTE
do
  create opera_route.make_empty (Zurich.station ("Polyterrasse"))
  opera_route.append_segment (Zurich.line (24), Zurich.station ("Central"))
  opera_route.append_segment (Zurich.line (7), Zurich.station ("Paradeplatz"))
  opera_route.append_segment (Zurich.line (2), Zurich.station ("Opernhaus"))
  Zurich.add_route (opera_route)
end
end

2 Temperature application

Listing 2: Class TEMPERATURE

note
description: "Temperature."

class
  TEMPERATURE

create
  make_celsius, make_kelvin

feature --- Initialization

  make_celsius (v: INTEGER)
  --- Create with Celsius value ‘v’.
  require
      above_absolute_zero: v >= − Celsius_zero
  do
      celsius := v
ensure
  celsius_value_set: celsius = v
end

make_kelvin (v: INTEGER)
  -- Create with Kelvin value 'v'.
require
  above_absolute_zero: v >= 0
do
  celsius := v - Celsius_zero
ensure
  kelvin_value_set: kelvin = v
end

feature -- Access

celsius: INTEGER
  -- Value on Celsius scale.

kelvin: INTEGER
  -- Value on Kelvin scale.
do
  Result := celsius + Celsius_zero
end

Listing 3: Class APPLICATION

Celsius_zero: INTEGER = 273
  -- The zero of the Celsius scale on Kelvin scale.

feature -- Measurement

average (other: TEMPERATURE): TEMPERATURE
  -- Average temperature between 'Current' and 'other'.
require
  other_exists: other /= Void
do
  create Result.make_celsius ((celsius + other.celsius) // 2)
ensure
  between: (celsius <= Result.celsius and Result.celsius <= other.celsius) or
          (other.celsius <= Result.celsius and Result.celsius <= celsius)
end

invariant
  above_absolute_zero: kelvin >= 0
end

Listing 3: Class APPLICATION

note
description : "Temperature application root class"

class APPLICATION
create
  execute

feature {NONE} -- Initialization

  execute
  -- Run application.
  local
    t1, t2, t3: TEMPERATURE
  do
    Io.put_string ("Enter the first temperature in Celsius: ")
    Io.read_integer
    create t1.make_celsius (Io.last_integer)
    Io.put_string ("The first temperature in Kelvin is: ")
    Io.put_integer (t1.kelvin)
    Io.new_line

    Io.put_string ("Enter the second temperature in Kelvin: ")
    Io.read_integer
    create t2.make_kelvin (Io.last_integer)
    Io.put_string ("The second temperature in Celsius is: ")
    Io.put_integer (t2.celsius)
    Io.new_line

    t3 := t1.average (t2)
    Io.put_string ("The average in Celsius is: ")
    Io.put_integer (t3.celsius)
    Io.new_line
    Io.put_string ("The average in Kelvin is: ")
    Io.put_integer (t3.kelvin)
    Io.new_line
  end

end

3 Ein Ticket für alles

Listing 4: Class APPLICATION

note
description : "ZVV information system."

class APPLICATION

create
  execute

feature {NONE} -- Initialization

  execute
  -- Run application.
do
    read_data
    if not read_error then
        Io.newLine
        print ("Eligible for discount: ")
        print (gets_discount)
    end
end

feature -- Access

birth_date: DATE
    -- Birth date.

home: STRING
    -- Home postal code.

work: STRING
    -- Work postal code.

age: INTEGER
    -- Age (difference in years between today's date and 'birth_date').
require
    birth_date_exists: birth_date /= Void
local
today: DATE
    do
        create today.make_now
        Result := today.relative_duration (birth_date).year
    end

feature -- Status report

valid_postal_code (pc: STRING): BOOLEAN
    -- Is 'pc' a valid postal code in Switzerland?
do
    Result := pc /= Void and then (pc.count = 4 and pc.is_natural)
end

in_zurich_canton (pc: STRING): BOOLEAN
    -- Is postal code 'pc' inside the canton of Zurich?
require
    valid_code: valid_postal_code (pc)
do
    Result := pc[1] = '8'
end

in_zurich_city (pc: STRING): BOOLEAN
    -- Is postal code 'pc' inside the city of Zurich?
require
    valid_code: valid_postal_code (pc)
do
end

gets_discount: BOOLEAN
  -- Is a customer with the current 'birth_date', 'home' and 'work' eligible for a
discounted seasonal ticket?
require
  birth_date_exists: birth_date /= Void
  valid_home_code: valid_postal_code(home)
  valid_work_code: valid_postal_code(work)
do
  Result := age < 25 or (in_zurich_cantion(home) and in_zurich_city(home) /=
  in_zurich_city(work))
end

feature {NONE} -- Implementation

read_error: BOOLEAN
  -- Did an error occur while reading user data?
read_data
  -- Read user input.
local
date_format: STRING
do
  date_format := "[0]dd/[0]mm/yyyy"
  print ("Enter birth date as dd/mm/yyyy: ")
  Io.read_line
  if not (create {DATE_VALIDITY_CHECKER}).date_valid(Io.last_string, date_format)
    then
    print ("Invalid date")
    read_error := True
  else
    create birth_date.make_from_string(Io.last_string, date_format)
  end
if not read_error then
  print ("Enter home postal code: ")
  Io.read_line
  home := Io.last_string.twin
  if not valid_postal_code(home) then
    print ("Invalid postal code")
    read_error := True
  end
end
if not read_error then
  print ("Enter work postal code: ")
  Io.read_line
  work := Io.last_string.twin
  if not valid_postal_code(work) then
    print ("Invalid postal code")
end
4 MOOC: Object creation and logic

The order in which the questions and the answers appear here in the solution may vary because they are randomly shuffled at each attempt.

Object creation Quiz:

- In class POINT you have the following creation routines:
  set_coordinates (x, y: INTEGER)
  set_color (col: STRING)
  default_create
Assuming that you have defined an entity of type POINT as
p: POINT,
match the instruction fragments on the left with those on the right to form correct creation instructions.
create {POINT} p.set_color ("green"), create p.default_create, create {POINT}.set_color ("black"), create p.set_coordinates (5, 4)

- In class POINT you have the following creation routines:
  set_coordinates (x, y: INTEGER)
  set_color (col: STRING)
Assuming that you have defined an entity of type POINT as
p: POINT,
which of the following are correct creation instructions?
create p.set_coordinates (-4,7), create p.set_color ("Red")

- In class POINT you have no creation routines, and the following routines:
  set_coordinates (x, y: INTEGER)
  set_color (col: STRING)
Assuming that you have defined an entity of type POINT as
p: POINT,
which of the following are correct creation instructions?
create p, create p.default_create, create {POINT} p, create {POINT}

- True or False? Suppose to have a reference p to class POINT with creation feature
  set_coordinates (x,y: INTEGER)
Then the effect of the following two instructions, executed in the given order, is to have an object attached to p initialized in a way that its coordinates are both 7.
create p.set_coordinates (7,7)
create p.set_coordinates (9,9)
Correct answer: false
• Suppose to have a class PERSON with an attribute current_job: JOB, where JOB is a class modeling a job. This should be an attribute for which Void is an acceptable value.
  Correct answer: true

• The first element of a class modeling a list data structure can never be Void.
  Correct answer: false

A bit of Logic quizzes
We don’t give solutions for this one.