Computer Games Exercises: 2022s s07 (non-physics)

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Contents

Answer header

Please put the author information in the header of all code files.

- `name (Name)`
- `coauthor list`

C03: Collision time

Preparation

Please read the source code of the "`Collision time`" game and understand the game logic.

There are a path along which an object is moving from left to right, a road, and a wall. The object movement is identified by the offset along the path with the speed V. After every interval T, the collision detection is performed. When a collision is detected at T_2, the collision time is calculated together with the information at $T_1 = T_2 - T$.

Task

Please extend the game.

- Implement the function `distance()` to calculate the physical distance from the object to the wall.

$$d = \begin{cases} x_{\text{wall\_left}} - x_{\text{object}} & \text{if } x_{\text{object}} <= x_{\text{wall\_middle}} \\ x_{\text{object}} - x_{\text{wall\_right}} & \text{if } x_{\text{object}} > x_{\text{wall\_middle}} \end{cases}$$

- Update the function `_process()` to perform collision detection after every interval T.
  - When the distance from the object to the wall is negative, there is an intersection.
  - When there is no collision (NC), draw a red circle at the current position of the object, and keep the object moving.
  - When there is an intersection (IS), stop the object, calculate the collision time with different methods, and show the results in the corresponding labels.
  - The collision time is represented referring to the start time of the object movement `timeStart`.
- Implement the function `update_actual()` to record the actual collision time by the frame time.
- Implement the function `fast_correction()` to estimate the collision time using the fast correction method.

$$\tau = T_1 + d(T_1)/V$$

- Implement the function `bisection()` to estimate the collision time using the bisection method.

$t_1 = T_1, t_2 = T_2$
while $|t_1 - t_2| > T/1000$:
  $t = (t_1 + t_2)/2$
  if NC at t : $t_1 = t$
  else : $t_2 = t$
$\tau = t_1$