# EXERCISE 8 — SOLUTION

## 1. Selection

(a) What are three general benefits of selection by IntenSelect over selection by ray casting?

**Solution**

- IntenSelect is less prone to jittering.
- Small and crowded objects can be selected more precisely with IntenSelect.
- IntenSelect can be customized to special situations.

(b) Name a situation where ray casting should still be preferred over IntenSelect.

**Solution**

- If a large object is located in the background, it will always get full scoring with IntenSelect, so smaller Objects in front of it cannot be selected.
- When only using point handles with IntenSelect, large objects can hardly be approximated, so ray casting should be preferred over IntenSelect.

(c) The first approach for determining the score contribution of an IntenSelect handle was

$$s_{contrib} = 1 - \frac{a}{\beta_{cone}} \quad .$$

Explain why this formula was changed to

$$s_{contrib} = 1 - \frac{\operatorname{atan}\left(\frac{d_{perp}}{d_{proj}^{k}}\right)}{\beta_{cone}}$$

in the second approach.
What are the benefits of the new formula and what is adjusted by changing $k$?

**Solution**

- With the second formula, an object's distance to the input device indirectly affects the scoring and benefits closer objects.
  → The angular score contribution distribution is narrowed with higher distance.
- $k$ affects the shape of the angular score contribution distribution. Lower values of $k$ further narrow it in the distance.

(d) Describe the effects of *stickiness* and *snappiness* of IntenSelect.

**Solution**

- *Stickiness* is the rate of decay, meaning how fast the total score of a handle reduces when the scoring in the current frame is reduced compared to the previous one. In other words: how long does the focus of a handle stick to the pointing ray.
- *Snappiness* is the rate of growth, meaning how fast the total score of a handle rises when the scoring of the current frame is increased compared to the previous frame. In other words: how fast does the focus of a handle snap to the pointing ray.

## 2. Redirected Walking

(a) Design an infinitely long virtual path and show that by using Redirected Walking, the path can be traversed using a finite real tracking area.
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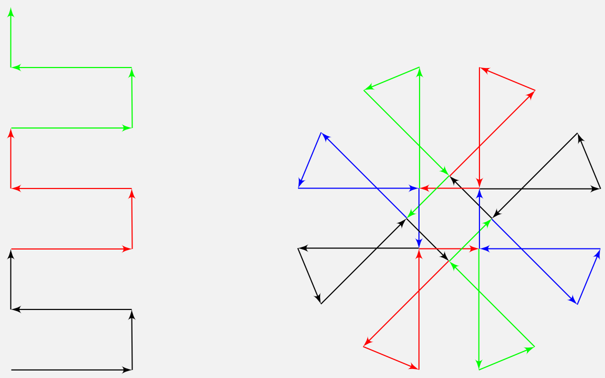
- Use only rotation gains between 0.8 and 1.2 (no translation or curvature gains).
- Fit the path into a real area of 4m×4m.
- The rotation gain can be changed instantly and as often as necessary.
- Choose the starting point within the real tracking space freely.

Sketch both the virtual and the real path. Stop as soon as a repetition becomes clear.

**Solution**



(b) Indicate at least two problems that can be expected to arise with your plan in practice.

**Solution**

- In a real application, the path a user is going to take is usually not known in advance, preventing fixed path designs.
- If the user's path is known (or predetermined by the application), real users would still not traverse the path perfectly. For example, they can be expected to round corners and deviate from the prescribed path due to gait imperfections, inattentiveness and other variations that are different for each user. Even over short times, this would induce significant variations from the intended path, requiring a larger tracking area in practice.
- Changing the rotation gain instantly (instead of over time) can increase the noticeability of Redirected Walking being used and may require smaller gains.