Assessment 1

September 17, 2022

Let us consider Centripetal Catmull-Rom Spline Interpolation in the two-dimensional space. Imagine half-sphere with the center in the origin and the radius r. See the Figure 1. Define the radius r as $r = 10 + \frac{m}{d}$, where m is the number of the month in your birthday date, while d is the day number. Solve the following problems, and explain your solution in details.

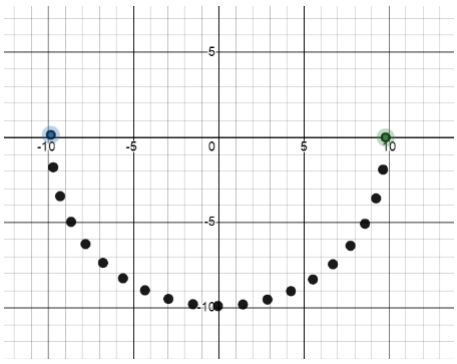

Figure 1: An example of a half-sphere with the diameter $r = 10$.

Problem (a). Let $p_1 = (-r, 0)$ and $p_2 = (r, 0)$. Find the coordinates of p_0 and p_3 in order to interpolate the half-sphere between p_1 and p_2.

Problem (b). Let $C(t)$ is the interpolated point given by the parameter $t \in [0, 1]$. Find the points $C(t_i)$ where $i \in \{0, 1, ..., 19, 20\}$ and $t_i = \frac{i}{20}$. List the point and plot the points onto the graph.

Problem (c). Find the root mean square error where the deviation is derived from the distance between points $C(t_0), C(t_1), ..., C(t_{20})$ and the half-sphere.