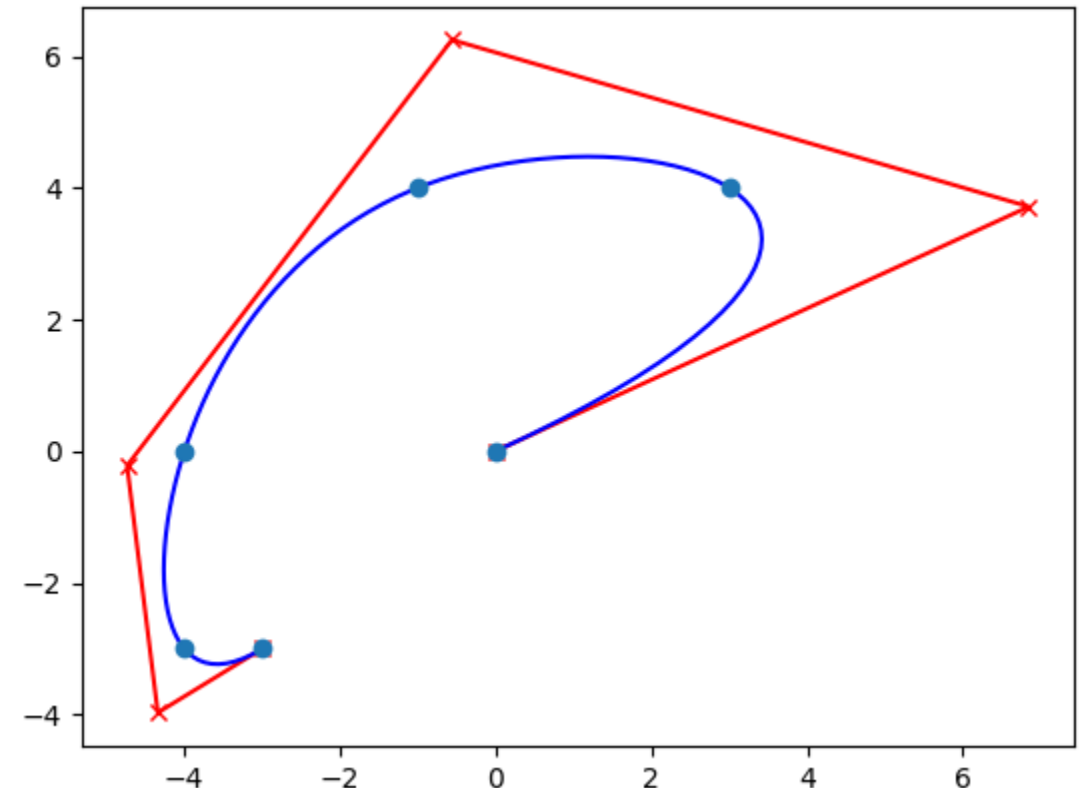


Assignment: B-Spline interpolation

B-spline curves do not generally interpolate their control points. To construct a B-spline curve that interpolates a given set of points Q_i we must find a set of (new) control points P_i that is different from Q_i except at the first and last index.

The algorithm(s) presented in the lecture computes P_i for given Q_i and polynomial degree as follows:

1. Compute the parameter positions \bar{t}_i for each Q_i using the centripetal method
2. Compute the knot vector using the averaging technique
3. Assemble the matrix of shape function evaluations and solve twice, once for all x coordinates and once for all y coordinates



Assignment: B-Spline interpolation

You are given the template https://gitlab.lrz.de/cms_ss2022/cie2/splineinterpolation_template.git. Remember to clone recursively and if needed to set the python executable. In some cases, you might also have to match the Visual Studio version and the python version (64-bit vs 32-bit). Make sure all tests run and check some of the previous python scripts to ensure the bindings work.

Your tasks are the following:

- Implement the algorithm to compute an interpolating B-spline curve as described above in C++ in the splinekernel library. Use the definitions that are already given in `inc/interpolation.hpp` and `src/interpolation.cpp`. Also, uncomment the unit tests in `test/interpolation_test.cpp`.
- Introduce python bindings for the function `interpolateWithBSplineCurve` and run the script `interpolateWithBSplineCurve.py`.

In order to pass the assignment all unit tests need to pass (at least all unit tests that were given), and the python script `interpolateWithBSplineCurve.py` needs to run.

Assignment: B-Spline interpolation

Moreover:

- Keep in mind that the interpolation tests also check whether an exception is thrown for invalid input. You can look for `CHECK_THROWS` or `REQUIRE_THROWS` in the tests. Running the tests while your code does not handle invalid input might result in crashes which may or may not be simple to trace. There are also comments in the template that give you some hints on where to check input and potentially throw an exception.
- Make sure to check out the additional python script `splineBuilder.py` which is an interactive version of `interpolateWithBSplineCurve.py`.

