ABOUT FUGRO

Fugro is the world's leading Geo-data specialist, collecting and analysing comprehensive information about the Earth and the structures built upon it. Through integrated data acquisition, analysis and advice, we unlock insights from Geo-data to help our clients design, build and operate their assets in a safe, sustainable and efficient manner. We are living in a period of intense and accelerating change. Over the coming decades, population growth, increasing wealth and urbanisation will lead to an increasing demand for energy, water, food, minerals, metals, buildings, industrial plants and infrastructure. Also, technology is changing faster than even before. This is affecting virtually every industry, opening up new opportunities for different, more effective ways of working. These global trends also lead to massive challenges for the world, most notably climate change. Therefore the future cannot just be about more; it also has to be about better. The energy mix, infrastructure and built environments have to evolve if tomorrow's problems are to be tackled successfully. Through our integrated and digital solutions we support clients in dealing with the challenges of today and tomorrow. Fugro provides the essential data, analysis and advice that our clients rely on to realise and operate their construction projects and infrastructure more safely, sustainably and efficiently. We sometimes play a small role in a client's project, but it is always critical.

Internship in Fugro for the Fugro Standardized Geodetic Calculation Engine.

Fugro Standardized Geodetic Calculation Engine is a standardized toolset of accessing and using Fugro geodesy library which allows you to perform geodetic calculations like horizontal and vertical transformations, projections, as well as interpret and present coordinate reference systems. The target users are developers who need to perform geodetic calculations in their software (they integrate geodetic engine in it) as well as spatial data processors using end-user applications.

Please see below example topics for internships

1. **Derive your own transformation software**

Clients very often expect position in coordinate reference system different than the one which GNSS or other processing software is providing. In some regions in the world, the transformation between coordinate reference systems is not defined or it is not accurate enough. Transformation can be determined in an empirical way based on the common points for relevant coordinate reference systems. As an intern, you are going to implement proof of concept of the application to determine transformation, including finding the most efficient transformation type (Helmert, similarity, affine or other) and parameter values.

2. **Extensive analysis for coordinate epoch influence on accuracy**

There are at least two types of coordinate reference systems based on the coordinates stability: local static (tectonic plate fixed) and global dynamic. To have an accurate transformation between them,

the time dependent parameters must be introduced for the transformation. Alternatively, special motion models are implemented, especially for regions lying on the tectonic plates border, like Iceland or New Zealand. For any approach there is a common requirement, already specified by EPSG geomatics committee - every position should have coordinate epoch specified with it. As an intern you will analyze different ways of using coordinate epoch and investigate its required accuracy for currently available time dependent transformation and point motion models.

3. **Verify declared transformations accuracy**

The transformations specified in IOGP - EPSG Geodetic Parameter Dataset have declared accuracy. There is a redundancy of the transformations: there are many transformations specified between the same coordinate reference systems. It allows geodesists to validate the declared transformations accuracy or redefine new ones based on the results. As an intern, you will study the existing transformations, compare results between them for commonly distributed test points and estimate their accuracy. If possible and feasible, new transformation should be derived from the results.

4. **Algorithm for finding the nearest value with SD increase for vertical transformations**

Mean Sea Level or geoid is often defined as a model with some distributed points (in a regular grid or just irregularly) of height offsets between the gravity related height and ellipsoidal height (usually WGS84). Many of these models are only available in the local area but the offshore operators have to use it while being outside of its boundaries. The algorithm to find the nearest value and calculate reliable increased standard deviation was already implemented but should be validated and refined. As an intern you are going to test it and look for possible improvements. Not only the accuracy of calculations is a main requirement but also its speed - high performance speed must be achieved.

Do you find any of these topics interesting? Do you know another idea for an internship you would like to do within Fugro for Fugro Standardized Geodetic Calculation Engine? Please contact Fugro geodesy team (*InEn.Geodesy@fugro.com*)