4.5. Example 5

Difficulties often arise when position and orientation data are to be shared among several users, and also when data from several sensors are to be combined in some way. One issue is that the data often come with different sampling rates, e.g. a GNSS and a radar will normally not have the same rate. Interpolation is usually necessary. If standard interpolation is used directly on latitude/longitude the interpolated positions will lie along a curved line. The curvature will increase when getting closer to the poles, and the interpolation will not work across the $\pm 180^{\circ}$ longitude meridian. However, when using n-vector, standard interpolation can be used directly. We have the positions of B at times t_0 and t_1, given as $\boldsymbol{n}_{EB}^{E}(t_0)$ and $\boldsymbol{n}_{EB}^{E}(t_1)$. The interpolated position at time t_i can be found exactly as

$$\boldsymbol{n}_{EB}^{E}(t_i) = \texttt{unit}\left(\boldsymbol{n}_{EB}^{E}(t_0) + (t_i - t_0)\frac{\boldsymbol{n}_{EB}^{E}(t_1) - \boldsymbol{n}_{EB}^{E}(t_0)}{t_1 - t_0}\right) \tag{16}$$

5. Conclusion

This paper has showed some of the benefits of using n-vector for calculations involving global horizontal position. To introduce the concept of n-vector to the radar community, some examples of common calculations in radar applications have been presented. We have seen that using n-vector often makes the code simple and vectorized, and the results are valid at all Earth positions, without exceptions or limited accuracy, for both short and long distances. Unambiguous notation is also essential in order to apply the correct transformations to the correct quantities.

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