'Practical Weather Routeing of Sail-assisted Motor Vessels'

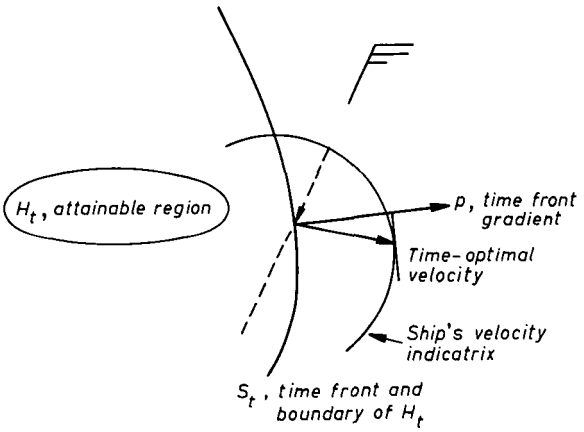
from C. de Wit

In section 2.1 (ii) Hagiwara and Spaans[1] present a 'new' construction of isochrones or time fronts. A point of a sublane, attainable from the preceding time front, i.e. the time front for time,

$$t_{k-1} = t_0 + (k-1)t$$

is selected as a point of the time front for time t_k on the criterion, that the great circle distance to the destination point X_f is minimal.

I have three severe objections to this – completely unexplained – construction. First, it produces different 'timefronts' for different destinations. Secondly, it seems inappropriate to use great circle distances as a time measure, while the ship's speed is far from constant in this problem. Finally, the above mentioned construction does not come anywhere near the observance of Pontryagin's Maximum Principle, which is an absolutely necessary condition for optimal control. In the least time problem this principle comes down to maximizing the projection of the ship's velocity vector onto the local direction of the time front gradient. This gradient is directed to the outside of the attainable region, perpendicular to the time front, which is the boundary of that attainable region. The following figure is intended to explain this.



A complete explanation and proof of the time front properties mentioned above can be found in a 1970 Netherlands Ship Research Centre report.[2]

REFERENCES

[1] Higiwara, H. and Spaans, J. A. (1987). Practical weather routeing of sail-assisted motor vessels. This *Journal*, **40**, 96.

[2] de Wit, C. (1970). Optimal Meteorological Ship Routeing. Netherlands Ship Research Centre TNO, Report No. 1425, Delft.