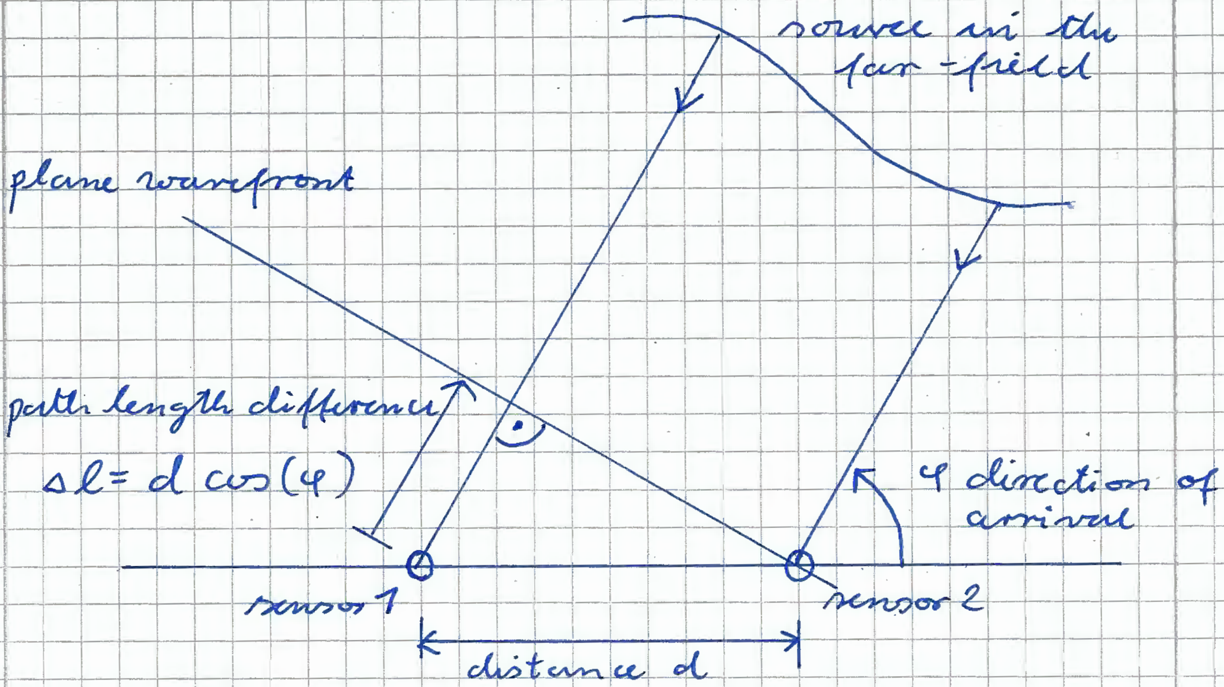
Direction of Arrival Estimation

Interferometer

at least two sensors (e.g. antenna elements) required



- wavenumber $\beta = \frac{2\pi}{\lambda}$
- phase shift $2\pi \frac{\Delta l}{\lambda} = \beta \Delta l = d\beta\cos(\varphi)$
- sinusoidal received signals

$$e_1(t) \sim \cos(\omega t)$$

$$e_2(t) \sim \cos(\omega t + d\beta\cos(\varphi))$$

Considering $0 \leq \varphi \leq \pi$ (due to the symmetry of the sensor array) there will be a one-to-one mapping between the observed phase shift and the direction of arrival φ if

$$d\,\beta \leq \pi$$

$$d \leq \frac{\pi}{\beta} = \frac{\lambda}{2}$$

(then the phase can be measured unambiguously as it will be inbetween $-\pi$ and $+\pi$).

=> promising approach, but needs further investigation:

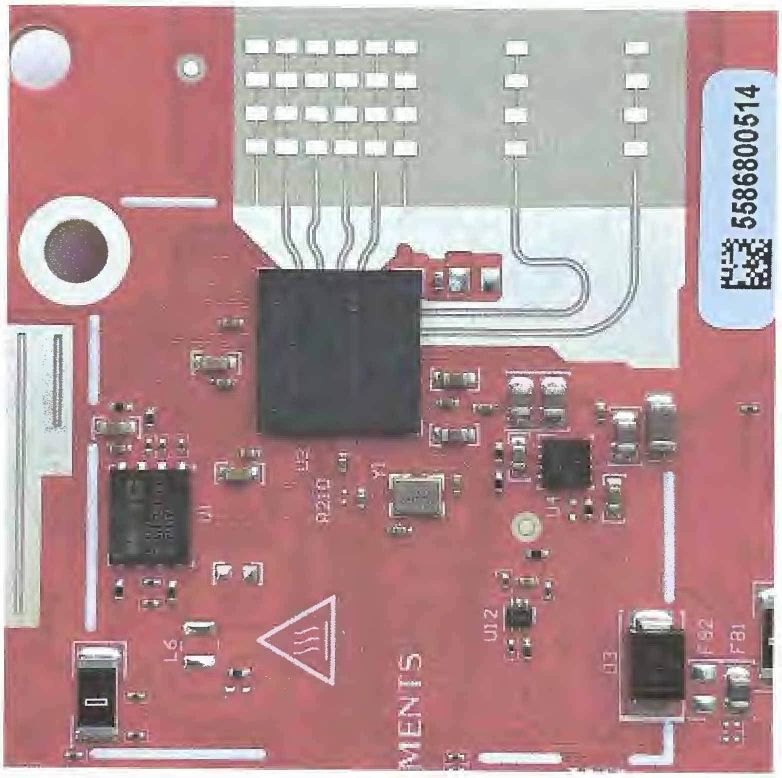
- more than two sensors
- several sources with different directions of arrival
- low complexity signal processing algorithms

Applications

- mobile radio communications
- intelligence
- sonar
- seismology
- radar
- radio astronomy

4 receive antenna elements

2 transmit antenna elements



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