



国立大学法人

岩手大学
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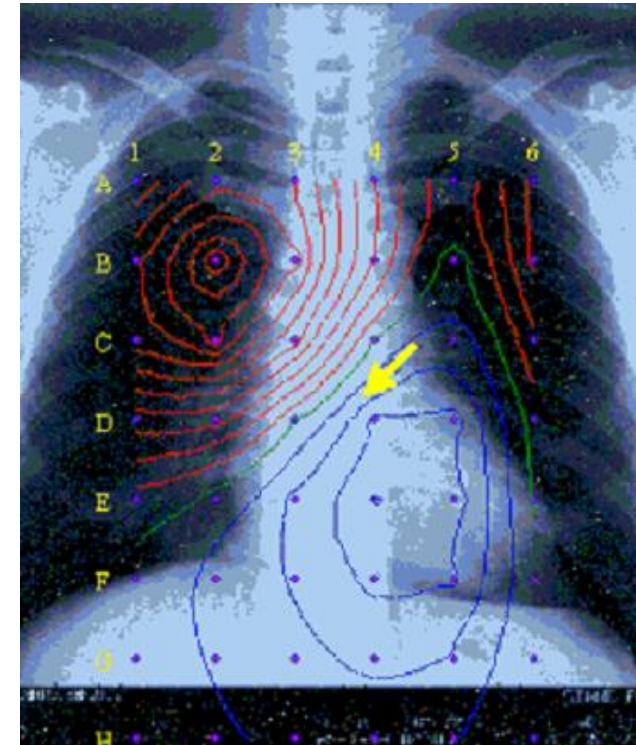
High-precision diagnostic system using magnetocardiography (MCG)

Background

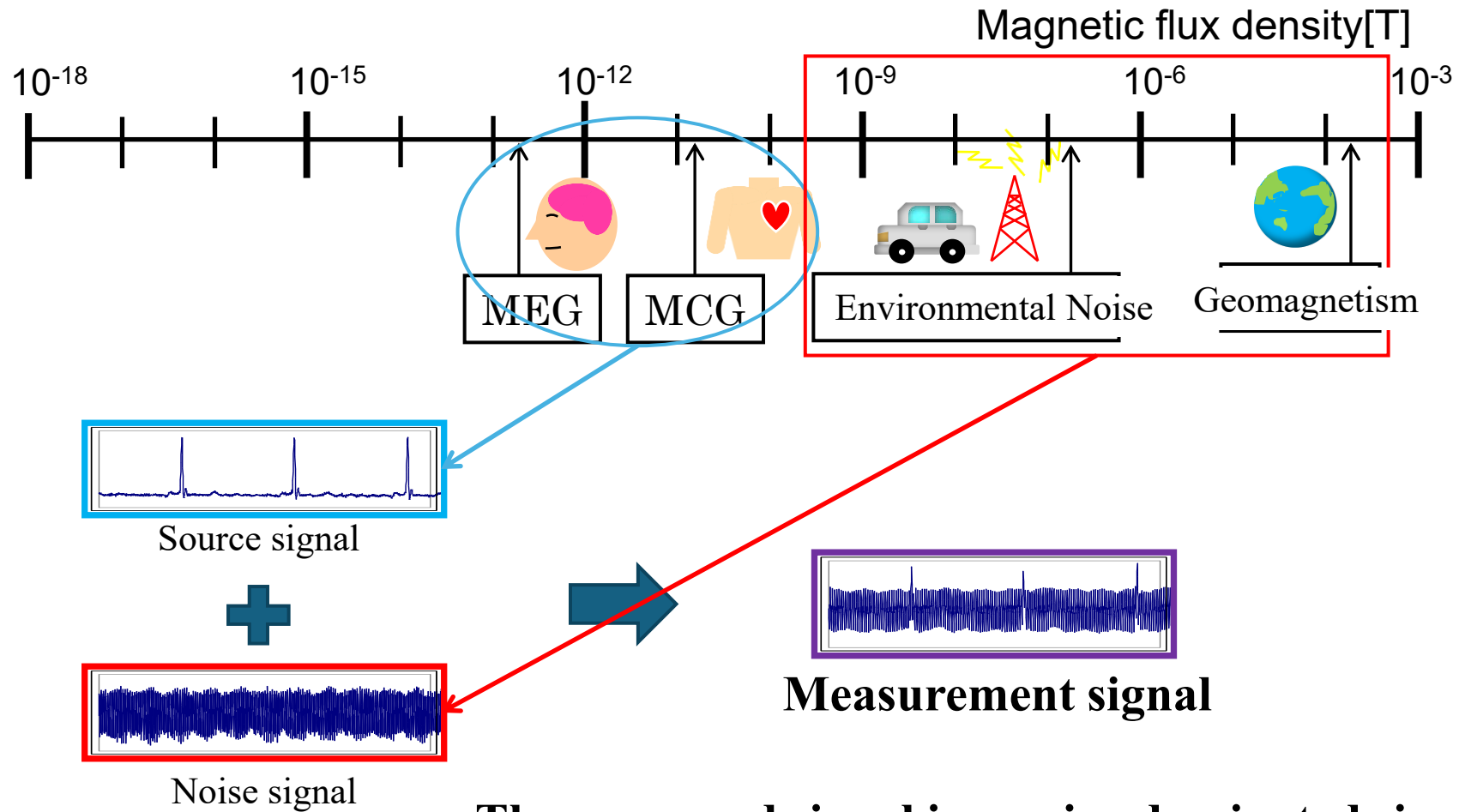
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Magnetocardiography is a technique that measures the electrical activity of the heart as a magnetic field.

Because the magnetic permeability within living organisms is constant, it is theoretically possible to estimate the location of a signal source in three dimensions from the measured signal.



Background

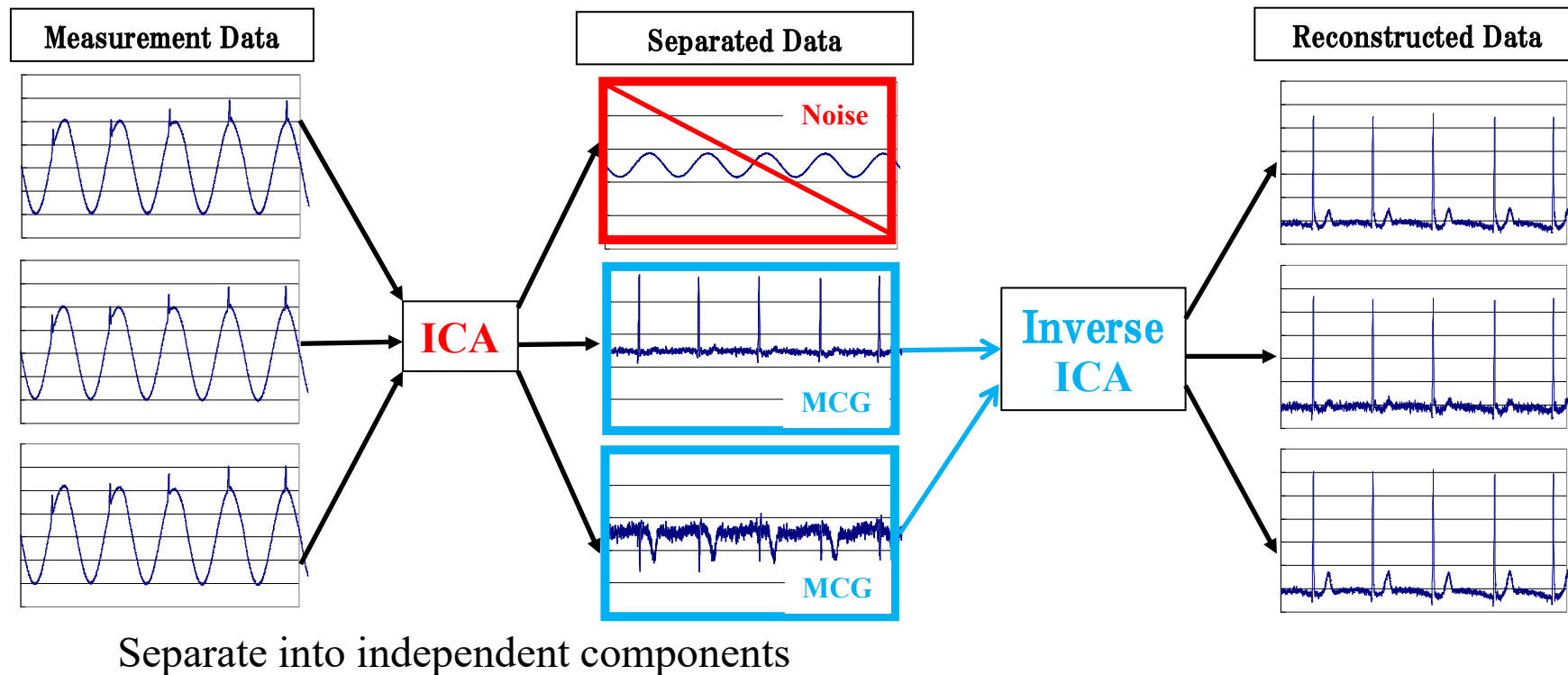


The measured signal is a noise-dominated signal.

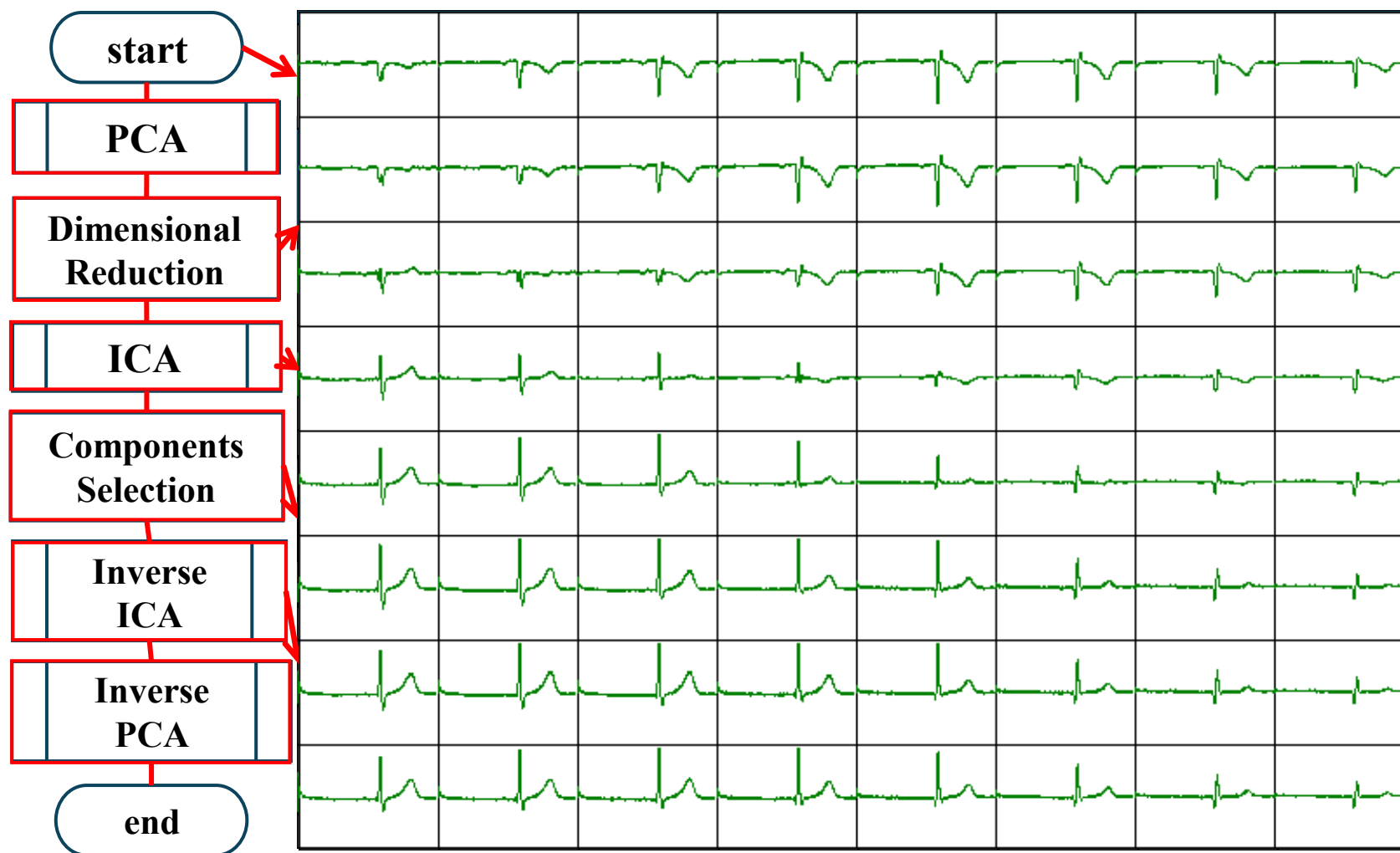
Denoise with ICA

Independent component analysis is a method that separates data into individual feature components based on their independence.

Extract and reconstruct only the signal components.



Noise reduction Process



3D estimation of signal source

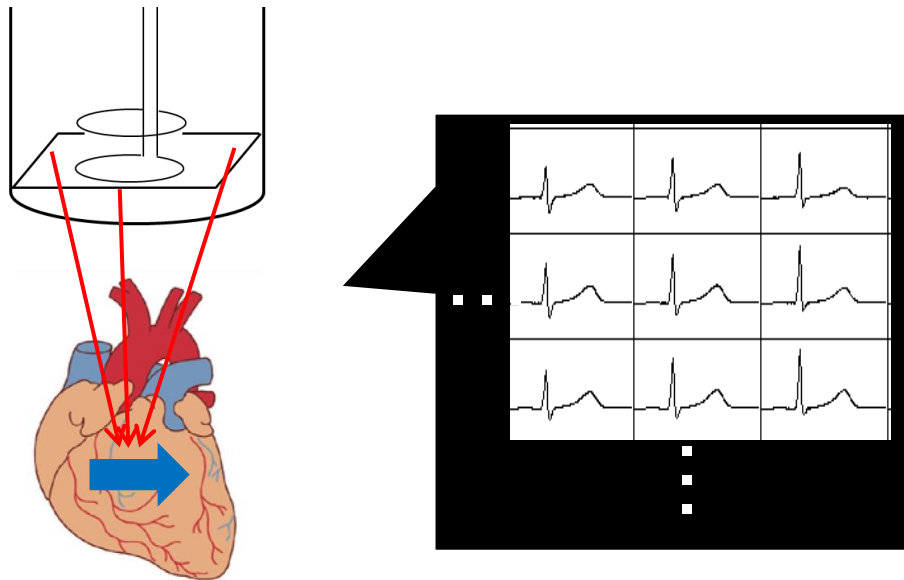
- By identifying the active areas of the heart, it is possible to estimate the abnormal areas by comparing them to normal cardiac activity.
- This estimation is possible by applying the Biot-Savart principle and Ampère's principle.
- The LORETA method is the most well-known method, and it was originally developed for magnetoencephalography (MEG).

Inverse Problem

The conclusion : The magnetic flux density measured by each sensor.



The cause : Micro-current generated due to the activity of the heart.



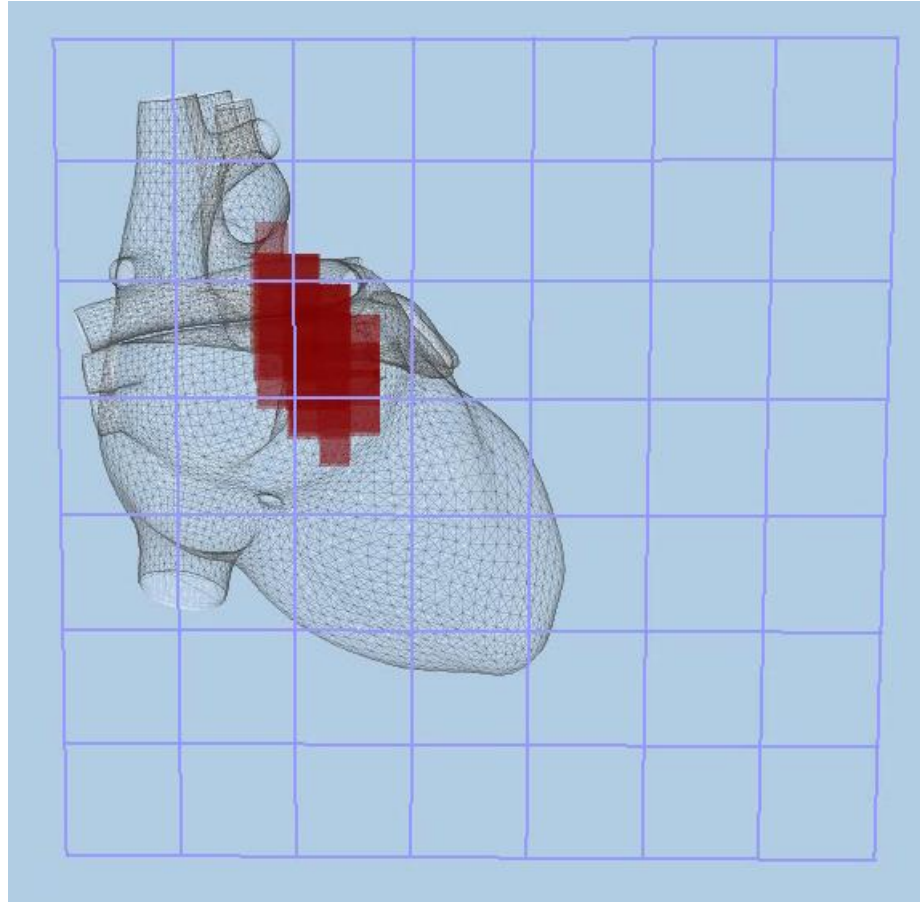
$$\textcircled{H} = \frac{\textcircled{I}}{2\pi \textcircled{r}} [\text{A/m}]$$

○ well-Know

○ Unknown

Estimation is performed using inverse problem solutions such as LORETA etc.

Estimation Results



- Active area
- Vector
- Movement path of the active area