1 Abstract

1.1 Figure of merit

Most cases of material's properties characterization requires a few factors, that can not be obtained within one measurement. Example connected with my PhD study is zT factor determination, showed in formula 1.

$$zT = \frac{\alpha^2 \times \sigma}{\lambda} \times T \tag{1}$$

where,

α Seebeck coefficient
σ Electrical conductivity
λ Heat conductivity
T Temperature

The Thermometric *figure-of-merit* (zT) is the most common parameter determining the operational properties of semiconductor material for energy generation using thermoelectric phenomenas (Seebeck effect, Peltier effect, Thompson effect) The equation should be written in the way showed by formula 2, emphasizing temperature dependence of measured parameters.

$$z(T) \times T = \frac{\alpha^2(T) \times \sigma(T)}{\lambda(T)} \times T \tag{2}$$

1.2 Measurements

The most precise way to determine zT of semiconductor is to measure its physical paremetrs separately and combine them to this factor, but here the scientific problem occurs: There is nearly impossible (considering time and cost restrictions) to measure all this parameters at the same temperature conditions.

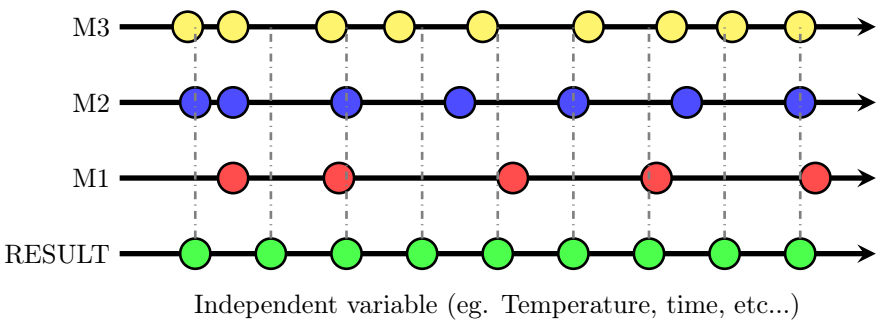

Figure 1: Idea of calculating parameter from non-aligned data

1.3 Data aligment

There are few possible ways to solve this problem,

1. If the offset between measurement points is relatively small we can ignore it and calculate the value taking the nearest neighbors
2. If the offset is small, but we do not want to ignore it we can interpolate the sub-result values by linear interpolation between two near points
3. We can go even more generic (for some strange reason) and approximate a few points with a polynomial
4. The most proper way is to model the phenomena, but it would be rather a new, different PhD thesis subject instead of life simplification idea.

Appendix

A Included example data

A.1 Electrical properties: MPT-electrical.txt

The most important columns are

3 - temperature in Kelvins

5 - Seebeck coefficient

8 - Electrical conductivity

A.2 Heat conductivity data

1. file: **MPT-lambda_table**, extracted heat conductivity in the function of temperature (Celcious scale)
2. file: **MPT-lamdba**, the file I get form heat diffusivity measurements with some recalculation resulting with head conductivity