Unit 15, part 55.1

Aphorisms, advices, anecdotes, brain teasers, curious stories, epigrams, epigraphs, epitaphs, ideas, crazy-creative ideas, koans, memorabilia, mottos, poems, proverbs, quotations, riddles, sayings, slogans, scurrilities, besun, etc.
collected for encouragement and the advantage of my students and myself.

Wort-Fundstücke, Gehörtes, Gelesenes, Zugelaufenes, Angeschwemmtes, …

Bitcoin Hype and Number Theory -
Number Theory and Bitcoin Hype
** https://en.wikipedia.org/wiki/Bitcoin
** https://de.wikipedia.org/wiki/Bitcoin

Lithium Hype im Erzgebirge
** https://www.freiepresse.de/WIRTSCHAFT/WIRTSCHAFT-REGIONAL/Lithium-Abbau-im-Erzgebirge-soll-in-vier-Jahren-starten-artikel9996367.php
** http://www.energy-saxony.net/mitglieder/deutsche-lithium-gmbh.html
** Prosp50.52.26/12.39.10

2009

M. Schmidt, H. Lipson. Distilling Free-Form Natural Laws from Experimental Data.
Science vol. 324, no. 5923, pp. 81-85

State of the art today?

ACDG-Curious manuscripts and codices
** Codex Gigas
** Carmina Burana
** Voynich manuscript
** Book of Kells
https://en.wikipedia.org/wiki/List_of_codices

Maschinelle Triebabfuhr
Spektrum der Wissenschaft 10.17, S.33

Wenn einer beim Lesen die Kapuze auf den Kopf gesetzt hat, so setze er sie so auf, dass man sieht, ob er schläft.
Zisterzienser Kloster Walkenried

Münzen als Datenspeicher
See M. Armstrong

Monster
https://en.wikipedia.org/wiki/Monster
Die alte Welt liegt im Sterben, die neue ist noch nicht geboren: Es ist die Zeit der Monster.
Antonio Gramsci (1891-1937)
https://en.wikipedia.org/wiki/Antonio_Gramsci
Kritische Diskussion dieses Zitats in seinem Kontext!

Nachtrag zu
ACDG Unit 30.1 – Mathematical analogues to maritime monster waves.

30.2

e = 2.7182818284…= [2; 1, 2, 1, 1, 4, 1, 1, 6, 1, 1, 8, 1,…]

$\Phi = \frac{1}{2}(\sqrt{5}+1) = 1.618033989... = [1;\ 1,\ 1,\ 1,\ 1,\ 1,\ 1,\ 1,\ 1,\ldots]$

$\sqrt{2}$ = [1; 2, 2, 2, 2, 2, 2, 2, 2, 2,…]

$5\sqrt{2}$ = [7; 14, 14, 14, 14,…]

$\sqrt{55}$ = [7; 2, 2, 2, 14, 2, 2, 2, 14, 2, 2, 2, 14, …]

$29\sqrt{2}$ = [41; 82, 82, 82, 82,…]

½($\sqrt{2}$ +1) = [1; 4, 1, 4, 1, 4, 1, 4, 1, 4,…]

$\frac{5}{2}\sqrt{2} = [3;\ 1,\ 1,\ 6,\ 1,\ 1,\ 6,\ 1,\ 1,\ 6,\ 1,\ 1,\ 6,...]$

$\sqrt{2}$ +½ = [1; 1, 10, 1, 1, 1, 10, 1, 1, 1, 10,…]

$\frac{1}{4}\sqrt{22*23} = [5;\ 1,\ 1,\ 1,\ 1,\ 1,\ 10,\ 1,\ 1,\ 1,\ 1,\ 1,\ 10,\ ...]$

$\frac{278+197\sqrt{2}}{334} = [1;\ 1,\ 1,\ 1,\ 556,\ 1,\ 1,\ 1,\ 1,\ 556,\ ...]$

$\sqrt{3}$ = [1; 1, 2, 1, 2, 1, 2, 1, 2, 1,…]

$\sqrt{5}$ = [2; 4, 4, 4, 4, 4, 4, 4, 4, 4,…]

$\frac{515+233\sqrt{5}}{622} = [1;\ 1,\ 1,\ 1,\ 103,\ 1,\ 1,\ 1,\ 1,\ 103,\ ...]$

$\sqrt{7}$ = [2; 1, 1, 1, 4, 1, 1, 1, 4, 1, 1, 1, 4,…]

$\sqrt{21}$ = [4, 1, 1, 2, 1, 1, 8, 1, 1, 2, 1, 1, 8, …]

$\sqrt{112}$ = [10; 1, 1, 2, 1, 1, 20, 1, 1, 2, 1, 1, 20, …]

$\frac{2393+144*\Phi}{1479+89*\Phi} = 1.617984451...$ (**)

= [1; 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 17, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1,…]

Extension 1

$$\frac{1}{2[afib(n-1)+fib(n-2)]} * \left[afib(n)+\sqrt{[afib(n)]^2+4afib(n-1)fib(n)+4fib(n-2)fib(n)} \right] =$$

$$[\underline{1;\ 1, 1, ...,1}, a, 1^n, a, 1^n, a, 1^n, ...]$$

n times

$fib(0) = fib(1) = 1$; $fib(i+2) = fib(i+1)+fib(i)$

Problem:

Find for given n such a's that

$$\sqrt{[afib(n)]^2+4afib(n-1)fib(n)+4fib(n-2)fib(n)} = A\sqrt{2} \ \underline{or}\ B\sqrt{5}\ ;$$

$$A,B \in \mathbb{N}$$

Example

n=4 $\rightarrow$ a=556, A=1970

Extension 2

$$\frac{afib(m)+Tfib(m)+fib(m-1)}{afib(m-1)+Tfib(m-1)+fib(m-2)} =$$

$$[\underline{1;\ 1, 1, ...,1}, a, 1, 1, 1, 1, ...] = [1^m, a, 1^\infty]$$

m times

$fib(0) = fib(1) = 1$; $fib(i+2) = fib(i+1)+fib(i)$

$$T = \Phi^{-1} = \frac{1}{2}(\sqrt{5}-1)$$

The simple continued fraction representation is an interesting tool to analyze the “inner discrete wave structure” of mathematical constants and functions.

The (**) example (as solution of a difference equation) shows “a **Rogue Wave** of the high 17 in the middle of normal sea waves of the high 1”. The next example models another

form of monster waves, the "**Three Sisters** 17, 17, 17 among normal sea waves 1".

$$\frac{2405+41026*\Phi}{1501+25605*\Phi}=1.602265182...$$

= [1; 1, 1, 1, 1, 17, 17, 17, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,…]

We have here a tool to model different kind of monster waves in a strong nonlinear sea system with random influences as a possible approach to a deeper understanding of their formation and maybe to their prediction. Such monster waves can work havoc on ships, offshore oil platform, offshore wind parks, and coasts.
Monster wave → ? local-temporal energy monster impact/line/bullet in a low energy background?
Also of interest for EE systems, esp. grids.
http://en.wikipedia.org/wiki/Rogue_wave
http://de.wikipedia.org/wiki/Monsterwelle
http://en.wikipedia.org/wiki/Oceanography

e = 2.7182818284…= [2; 1, 2, 1, 1, 4, 1, 1, 6, 1, 1, 8, 1,…]
How about
[1; 2, 1, 4, 1, 6, 1, 8, 1,…]
[1; 1, 1, 2, 1, 1, 1, 4, 1, 1, 1, 6, 1, 1, 1, 8, 1,…]
[1; 1, 1, 1, 2, 1, 1, 1, 1, 4, 1, 1, 1, 1, 6, 1, 1, 1, 1, 8, 1,…] ?
30.3
Find number monsters in escf(e) und escf(π).
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Untersuchen Sie den Verlauf der Funktion

$$f(x,k) = \frac{\sum_{i=1}^{\infty} \frac{1}{i^x}}{\sum_{i=k}^{\infty} \frac{1}{\binom{i}{k}^x}} \; ; k \in \mathbb{N}$$

für

** $x \in \mathbb{R}$ (Graph, Kurvendiskussion),

**$x \in \mathbb{C}$ (Reliefdarstellung)

vgl. Jahnke-Emde. Tafeln höherer Funktionen.
Leipzig 1952, S. 268
http://mathworld.wolfram.com/RiemannZetaFunction.html .

Kopplung von Algorithmen

Go to Unit 1 part
„Vom Babylonischen sqr(2) Algorithmus zum Heron sqr(a) Algorithmus“

„Erweiterung: $x^2 = 2 \rightarrow x^2 = a \in \mathbb{R}_+$

Beibehaltung aller “guten” Eigenschaften: korrekt, robust, quadratische Konvergenz!

Mathematische Notation des Heron sqr(a) Algorithmus

$$a, x[0] \in \mathbb{R}_+$$

$$x[i+1] = \frac{1}{2}(x[i] + \frac{a}{x[i]}) \; ; i = 1,2,3,...$$

$$\lim_{i \to \infty} x[i] = sqr(a)$$

Haltbedingung: erstmalig abs(x[i+1]-x[i]) ≤ ε „

Experimentieren Sie mit zwei gekoppelten Heron-Algorithmen

$$x[i+1] = \frac{1}{2}\left((k_{11}x[i]+k_{12}y[i]) + \frac{a}{(k_{11}x[i]+k_{12}y[i])} \right)$$

$$y[i+1] = \frac{1}{2}\left((k_{21}y[i]+k_{22}x[i]) + \frac{b}{(k_{21}y[i]+k_{22}x[i])} \right)$$

$$i = 0,1,2,3,4,...$$

$$a, b, x[0], y[0] \in \mathbb{R}_+ ; k_{mn} \in \mathbb{R}$$

mit verschiedenen

** Startwerten x[0] und y[0] $\in \mathbb{R}_+$,

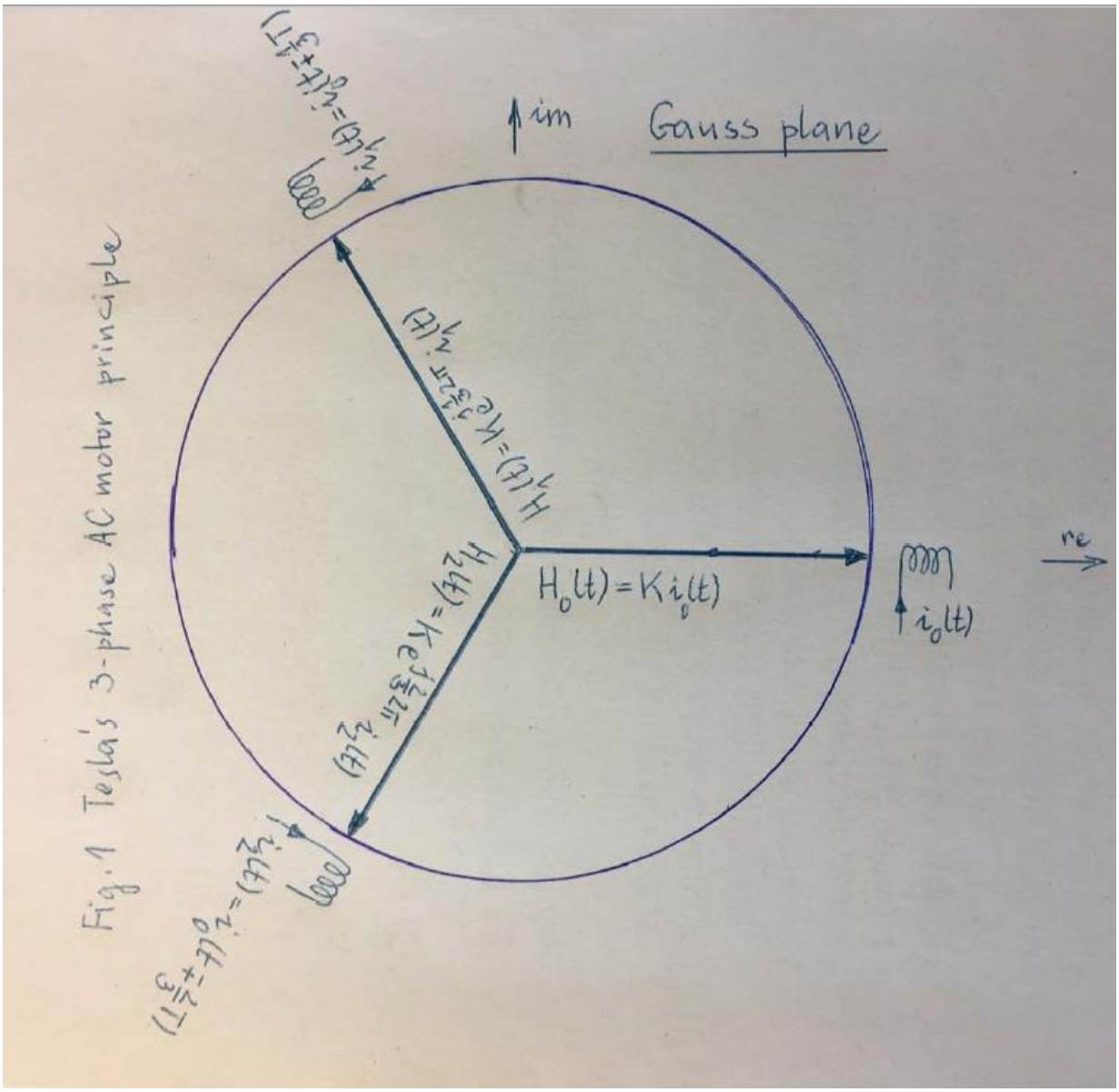
** Eingaben (Radikanden) a und b $\in \mathbb{R}_+$,

** Kopplungsfaktoren $k_{mn} \in \mathbb{R}$.

Klassifizieren Sie die dabei zu beobachtenden Verhaltensmuster.
Erweitern Sie die Experimente und die zugehörigen Auswertungen und Interpretationen auf 1D und 2D Arrays von gekoppelten Heron-Algorithmen.

Diskutieren Sie mögliche Anwendungsfelder.
Lateral:
https://de.wikipedia.org/wiki/Gekoppelte_Pendel
http://www.physik.uzh.ch/~truoel/personal/Skript_WS/Gek_Schwingungen.pdf
https://en.wikipedia.org/wiki/Oscillation
https://en.wikipedia.org/wiki/Lateral_inhibition

Tesla's 3-phase AC motor principle.
Mathematical description
Extension to a pattern generator.
N. Tesla. My Inventions.
Hart Brothers 1982. ISBN 0-910077-00-2
https://de.wikipedia.org/wiki/Dreiphasenwechselstrom



Input:
Three-phase T-periodic power supply
$(i_0(t), i_1(t), i_2(t))$ (1.1)
with

$$i_k(t) = i_k(t + mT);\ k \in \{0,1,2\},\ m \in \mathbb{Z} \qquad (1.2)$$

$$i_k(t) = i_0\left(t \mp \frac{k}{3}T\right) . \qquad (1.3)$$

Output:
Rotating magnetic field vector H(t)

$$H(t) = H_0(1) + H_1(1) + H_2(1)$$

$$= K[i_0(t) + e^{j\frac{1}{3}2\pi} i_1(t) + e^{j\frac{2}{3}2\pi} i_2(t)]$$

$$= K[i_0(t) + e^{j\frac{1}{3}2\pi} i_0(t \mp \frac{1}{3}T) + e^{j\frac{2}{3}2\pi} i_2(t \mp \frac{2}{3}T)]$$

(2)

Special cases

** $i_0(t) = i_0 \rightarrow H(t) = 0$ (3)

** $i_0(t) = \hat{i}\cos(2\pi\frac{t}{T}) \rightarrow H(t) = \frac{3}{2}K\hat{i}e^{\pm j2\pi\frac{t}{T}}$

(4)

The tip of the vector H(t) draws counterclockwise/clockwise a circle $x^2 + y^2 = r^2$ with the radius $r = \frac{3}{2}K\hat{i}$ in the Gauss plane.

This raises the questions as which input generates in the same way

an ellipse $\left(\frac{x}{a}\right)^2 + \left(\frac{y}{b}\right)^2 = 1$,

an superellipse $\left|\frac{x}{a}\right|^n + \left|\frac{y}{b}\right|^n = 1$

https://en.wikipedia.org/wiki/Superellipse ,

http://mathworld.wolfram.com/GearCurve.html
http://mathworld.wolfram.com/DevilsCurve.html ,

patterns created by Gielis' superformula
https://en.wikipedia.org/wiki/Superformula ,
and suitable extensions (see also AsSis, Unit 3).

$$i_0(t) = \hat{i}\cos(n2\pi\frac{t}{T})\ ;\ n=0,1,2,3,..\ \rightarrow$$

** $$H(t) = \frac{3}{2}K\hat{i}\begin{cases} 0 & \text{for } n \bmod 3 = 0 \\ e^{\pm jn2\pi\frac{t}{T}} & \text{for } n \bmod 3 = 1 \\ e^{\mp jn2\pi\frac{t}{T}} & \text{for } n \bmod 3 = 2 \end{cases}$$

(5)

** Find and discuss the output H(t) for the Fourier series T-periodic input

$$i_0(t) = \frac{A_0}{2} + \sum_{n=1}^{\infty}(A_n\cos(n2\pi\frac{t}{T}) + B_n\sin(n2\pi\frac{t}{T}))$$

(6) ,

More in Unit 268:

** Fig. 1 = abstract electrical component “Ro”

** Ro with external R-L-C-IC-circuitry

**

$$H(t) = \frac{3}{2}K\hat{i}e^{\pm j2\pi\frac{t}{T}} \quad \text{via "}\mathrm{rot}\vec{E}(t) = -\mu_0\frac{\partial\vec{H}(t)}{\partial t}\text{"} \rightarrow E(t) = ?$$

(7)

** HF-Ro as transmitter

** Linear Ro

** $Ro_1 \oplus Ro_2$ = ?

** 2D-Ro → 3D-Ro
** Macro/micro/nano realizations of Ro

17.11.2017 EPSnoct



Photo by Shen Li, Chongqing University “Tree ear antenna array”