1. Lifetime.nb

Starting Lecture about Technical Statistics

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■ 1.1. Begin

■ 1.1.1. The Prayer of Moses

In the 90th Psalm of the Holy Bible Moses prays:

> *12. So teach [us] to number our days, that we may apply [our] hearts unto wisdom.*

■ 1.1.2. The Death of Professor Schwenter (1585-1636)

In 1636 appeared at Nürnberg the fourth edition of his teaching book *Mathematische und Philosophische Erquickstunden (Mathematical and Philosophical Refreshing Hours)*, describing combinatorics, encrypting and technical inventions as the filled pen being carved of a goose-quill and later being replaced by the fountain-pen or the ink pencil respectively.

About his work at the University of Nürnberg-Altdorf a commemorative book reports ([Reck1998], pages 109-110, cited and translated partially):

"Daniel Schwenters Hauptwerk beginnt im Titel mit dem lateinischen Wort *"deliciae"*, zu deutsch Freude, Vergnügung, Liebhaberei etc., und die Freude an seiner mathematischen Wissenschaft und die Freude am Leben charakterisieren diesen Mann und ziehen sich wie ein roter Faden durch seine Biographie. Will bemerkt dazu: *"... durch seinen besonders aufgeweckten, scherzhafften und lustigen Kopf ist Schwenter überall berühmt worden und angenehm gewesen."* Merkwürdig düster und jäh wie ein Unwetter zieht dann das Ende dieses geglückten Lebens herauf – doch davon später! ..."

"Daniel Schwenter's main volume in the title starts mit the Latin word *"deliciae"*, in English joy, pleasure, fondness etc., and the joy of his mathematical science and the joy of life characterize this man und draw like a red thread through his biography. Will remarks about: *"... by his singularly brisk, facetious and merry head, Schwenter has become everywhere famous and has been agreeable."* Strangely gloomy and sudden like a bad weather then approaches the end of this succeeded life—but later of this! ..."

"Mit 23 Jahren, im Februar 1608, wird Daniel Schwenter an der Altdorfer Akademie Professor der Heiligen Sprache, d. h. des Hebräischen. ... 1625 erhält er die Professur für alle orientalischen Sprachen und erst 1628 den Lehrstuhl für Mathematik, obwohl er schon lange ..."

"At the age of 23 years, in February of 1608, Daniel Schwenter has become professor at the academy of Altdorf in the Holy Language, meaning Hebrew. ... In 1625 be has become professor of all oriental languages and not before 1628 the chair of Mathematics, though he already for a long time ..."

"... Auch Ehrungen blieben nicht aus: Er erhielt einen Ruf nach Wittenberg und nach Würzburg, lehnte aber beide ab, er war viermal Dekan der philosophischen Fakultät und einmal Rektor. Bestürzend ist Schwenters früher Tod:"

"... Also honours didn't stay away: He got a call to Wittenberg and to Würzburg, both he rejected, he was four times dean of the philosophical faculty and once headmaster. Confusing is the early death of Schwenter:"

"Im Jahre 1636, den 19. Januar brachte seine Eheliebste 2 Kinder, eines lebendig, das andere tod zur Welt und starb selbigen Tages an der Geburt. Er selbst war schon krank, betrübte sich über den Tod seines Weibes und folgte ihr in einer Stunde nach, und wurde also den 25. Jan. mit Weib und Kind selb dritt begraben." (Will)

"In 1636, on January 19th, his wife bore two children, one alive, the other dead and died at the same day because of the birth. He himself has already been ill, grieved about the death of his wife and followed her within one hour, and thus was also buried on January 25th together with wife and child being three at all." (according to Will)

■ 1.1.3. The Mathematical Center of Life

■ 1.1.3.1. Remarks

Mathematics is proper not just for philosophical refreshing hours, but also to judge the relative time perception of human.

The presented way of thinking is contested, because the consequences to world-outlook are sometimes disagreeable.

■ 1.1.3.2. Weber-Fechner's Law

The elaborations of Weber and Fechner (founder of psychophysics or neurophysiology respectively, 1801-1887) result to a logarithmic scaling of perception of nerves. Thus the perception of brightness or loudness of human results to the impression, that double signal followed by a four times signal are equivalent amplifications. The technical unit of loudness thus is **Phon** (DIN 45 630), being a middled weight of the perception of test persons, while the unit **Dezibel [dB]** for measuring instruments is yielded to the following:

$$z = 10\,\mathrm{Lg}\Big[\frac{I_2}{I_1}\Big] = 10\,\mathrm{Lg}\Big[\frac{p_2^2}{p_1^2}\Big] = 20\,\mathrm{Lg}\Big[\frac{p_2}{p_1}\Big] \tag{1.1}$$

Here is:
- I_1 Intensity of reference, when using the unit **[dB (*A*)]** according to DIN 45 633, being a standardized reference curve for the signal of the instrument
- I_2 unknown intensity
- p_1, p_2 corresponding sound pressures
- **Lg[ ]** logarithm to base **10**

Extensive references about this topic are instructions used to practical courses of physics for medical students (e.g. [MS1998], experiment 9; sound and ultrasound)

An analogon to this has been established when measuring brightness. Historically has been established the idea of *Hellempfindlichkeit (perception of brightness)* ([BeS1993], **volume 3** (optics), page 147 and 732).

Another example is pitch, which in music is described by fractions of double frequency (octave), while the frequency of resonance of technical oscillators has got the unit **Hertz [Hz]**:

$$1\,\text{Cent} = \frac{\text{half}-\text{tone}}{100} = \frac{\text{Octave}}{1200} = 2^{\frac{1}{1200}\,\frac{\text{Log}[\frac{f_2}{f_1}]}{\text{Log}[2]}} = 2^{\frac{\text{Log}[\sqrt[1200]{\frac{2\,f_1}{f_1}}]}{\text{Log}[2]}} = \sqrt[1200]{2} \tag{1.2}$$

The base **2** of the logarithm at this calculation must be again the base of the power term. Thus here **1200 Cent** is the measure of the octave (doubled frequency). **Cent** like **dB** is a *relative measure*. An absolute pitch needs beyond this a fixed *concert pitch*; at the beginning of the 21st century the sound ***a'*** has been given by **440 Hz**, in former times it had also been about **415 Hz**.

Tuning instruments for musical instruments have got both scales to be able to get also alternatively the resonance frequency of a machine. Furthermore there is a possibility to vary the concert pitch, being welcome especially to older guitars by softer sound and lower concert pitch.

■ 1.1.3.3. General Ansatz of Mathematical Description of Human Perception

If Weber-Fechner's law is applied to all subjective human perceptions of nerves, this leads to the following *metrics of relative perception*:

$$\textbf{measure} = a^{\textbf{intervalfactor}\,\frac{\text{Log}[\frac{I_2}{I_1}]}{\text{Log}[a]}}$$

$$\left(\frac{I_2}{I_1}\right)^{\text{intervalfactor}}$$

Each perception threshold I_1 determines the minimum unit of physiological (not: "physical") world of experience. The reference number a often is number **2**, because a double or a half can be imagined well.

For a logarithmic measure of time the bisection of a measured value is not possible without a relative reference, because the starting point Zero will be transformed to $-\infty$ (minus infinity).

But on the other hand, all human perceptions (and also technical instruments) have got a *lowest threshold of perception*, thus for the actual consideration the relation of measured value and perception threshold can be used. By this the logarithmic measure has been calibrated: it starts with the logarithm of relation One:

Start = Log[1]

0

Logarithmic measures and the discussion of relations of values correspond to each other. The checking of units happens in a way that the argument of the logarithm always is *without dimension* (without unit).

■ 1.1.3.4. Relative Perception of Lifetime

Eventually the lowest perception time of human is given by the *auditive ordering threshold*, because the ear anyway deals with an analysis of frequency and time of sound oscillations.

The auditive ordering threshold is found out by giving time-interrupted impulses via loudspeaker to the ear, where the examined person has to judge, whether one or two events took place.

The value of the auditive ordering threshold is about a septh or an eighth of a second ([Dick2002], section 4.3.2, page 58), its reciprocal at **7 Hz** or **8 Hz**, where from **16 Hz** on a low sound can be heard. Trained skilled workers know the sounds and noise of their machine and by this they can hear whether all is working correctly.

An alternative perception time is the *moment of the eye*, which can be examined by the repeating rate of moved pictures. The repeating rate of pictures determines how many pictures can be percepted at maximum within one second. Its value is about **15 Hz**, where older movies already used **25 Hz** to change the moved pictures.

Because of these preparatorial considerations there is a possibility of about seven events per second for humans. The shortest occurence periode thus has got a septh of a second.

The longest possible occurence periode of a human is assumed to be the whole lifetime. According to Moses the value is **70** to **80 years**:

10. The days of our years [are] threescore years and ten;
and if by reason of strength [they be] fourscore years,
yet [is] their strength labour and sorrow;
for it is soon cut off, and we fly away.
(Psalm 90,10)

The naming of person's names to highs and depressions by the meteorologists emphasizes the volatile character of our life, which certainly can cause benefit and damage.

■ 1.1.3.5. Calculation Rules of Logarithmic Scaling

To get a feeling about the relative center of life, an average being proper to the subjective perception is computed.

By the following formula the relative center of live can be calculated, namely the time, that is—according to human perception— the average of the shortest and longest possible occurence:

RelativeLive[TotalAge_, OrderingThreshold_, RelativeFactor_] =

$$2^{\text{RelativeFactor}\,\frac{\text{Log}\left[\frac{\text{TotalAge}}{\text{OrderingThreshold}}\right]}{\text{Log}[2]}}\ \textbf{OrderingThreshold // PowerExpand}$$

$$\text{OrderingThreshold}^{1-\text{RelativeFactor}}\ \text{TotalAge}^{\text{RelativeFactor}}$$

The check of this results:

RelativeLive[TotalAge, OrderingThreshold, 1]

TotalAge

RelativeLive[TotalAge, OrderingThreshold, 0]

OrderingThreshold

The formula to get the center of live(time) is the *geometric average* of total age and auditive ordering threshold:

CenterofLive[TotalAge_, OrderingThreshold_] = RelativeLive[TotalAge, OrderingThreshold, $\frac{1}{2}$]

$\sqrt{\text{OrderingThreshold}}\ \sqrt{\text{TotalAge}}$

This results with concrete numbers to the following:

UnitsSI = {"a" → $\left(365 + \frac{1}{4}\right)$ "d", "d" → 24 "h", "h" → 60 "min", "min" → 60 "s", "ms" → $\frac{\text{"s"}}{1000}$}

$\left\{\text{a} \to \frac{1461\ \text{d}}{4}, \text{d} \to 24\ \text{h}, \text{h} \to 60\ \text{min}, \text{min} \to 60\ \text{s}, \text{ms} \to \frac{\text{s}}{1000}\right\}$

result = CenterofLive[#, 147 "ms"] & /@ {1 "a", 12 "a", 70 "a", 100 "a", 950 "a"} //. UnitsSI // *N*

{2153.83 s, 7461.07 s, 18020.2 s, 21538.3 s, 66385.4 s}

This is an alarming short time!

The results can be given in hours:

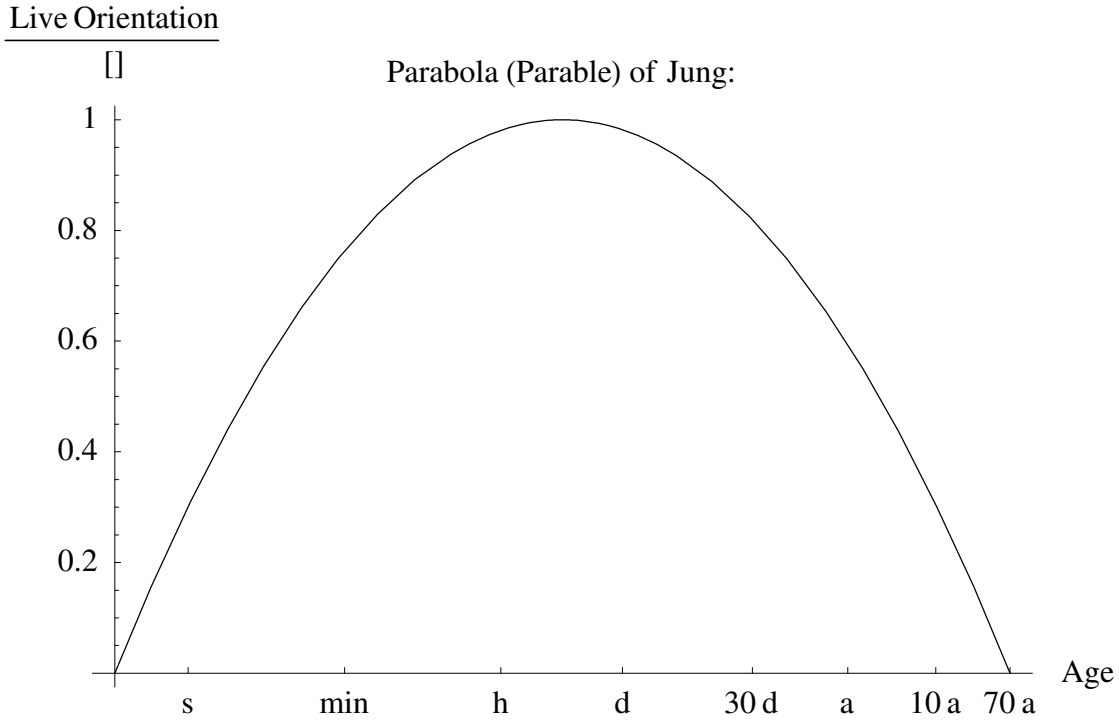
result /. "s" → $\frac{\text{"h"}}{3600}$

{0.598285 h, 2.07252 h, 5.00561 h, 5.98285 h, 18.4404 h}

The meaning of this is that the percepted difference between a moment of a septh of a second and five hours duration is the same to a human as these five hours and an age of seventy years!

Five or six hours after procreation half of relative live already is over! This is hard to grasp and stresses even according to C. G. Jung the importance of the old church hymn of Martin Luther (1483-1546) having the title *"Mitten wir im Leben sind von dem Tod umfangen" (In the middle of live we are embraced by the death")*, which he composed in 1524:

```
FewAgeValues = {1 "s", 1 "min", 1 "h", 1 "d", 30 "d", 1 "a", 10 "a", 70 "a"};
FewAxesTicks = { Log[ # / (147 "ms") ] / Log[ 70 "a" / (147 "ms") ] } //. UnitsSI // N, # } & /@ FewAgeValues;
$DefaultFont = {"Times", 12.};
Plot[4 x (1 - x), {x, 0, 1},
  AxesLabel → {"Age", " Live Orientation / [ ] "}, Ticks → {FewAxesTicks, Automatic},
  PlotRange → All, PlotLabel → "Parabola (Parable) of Jung:" ];
```



This figure proofs that a human already has spent three quarters of his percepted live within his mother if an old age is reached. In spite of this the remembrance to this time within the womb is beyond human control.

■ 1.1.4. Frame Condition to all Research Activities

Live is shorter than one is used to imagine.

At a tendency to suicide this is a good comfort to wait for the rest, yet.

At a tendency to frivolity at least the estate should be arranged.

There is a repeating contesting against the indicated calculation, because it proofs unmistakable by calculation that the topic of death should not be pushed away. Who has understood this calculation and in spite of this does not write his last will and testament, he is silly. Especially university men repeat in spite of this to think themselves to be so immortal that they put off the arranging of their estate to unknown time.

The arrangement to a study because of this mainly should be started if the burning questions of live already mostly have been answered.

The only man comming back from death until now is named *Jesus Christ*. The reason of this is that he came from heaven to earth and became a human. He cites Abraham the following:

31. And he said unto him, If they hear not Moses and the prophets,
neither will they be persuaded, though one rose from the dead.
(Luke 16,31)

In former times the following greeting has been used in Germany:

Behüt' uns Gott, bis wir uns wiedersehen – hier auf Erden oder dort im Licht!
God shall keep us until we see again—here on the earth or there in the light!

The Bavarian variante until now has been conserved even in Munich:

Pfüat di Gott! or *Pfüat Ihnen Gott!*
God shall keep you! or *God shall keep thou!*

In Spain this greeting at leave-taking is:

Hasta la vista ad dios!

■ 1.1.5. Protocol

The *Mathematica* version has been:

{$Version, $ReleaseNumber, $LicenseID}

{Microsoft Windows 3.0 (October 6, 1996), 0, L4526−3546}

The calculation time was (in seconds):

TimeUsed[ ]

0.95

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