https://doi.org/10.7494/human.2024.23.2.6328

Tadeusz Sierotowicz*

Copernicus Center for Interdisciplinary Studies, Krakow, Poland
Istituto Superiore di Scienze Religiose di Bolzano, Italy
IISS Gandhi di Merano, Italy
ORCID: 0000-0001-8049-3957

Tomasz Sierotowicz

Jagiellonian University Faculty of Management and Social Communication
Institute of Economics, Finance and Management
Department of Economics and Innovation Krakow, Poland
ORCID: 0000-0002-1462-8267

MEASURE HAPPINESS – A CONTRIBUTION TO STANISLAW LEM'S DEFINITION OF HAPPINESS. PART 2: LIMITS OF APPROACH[1]

In the fable *Kobyszczę*, Stanisław Lem proposes a definition of Happiness that allows for the formulation of a mathematical model describing the intensity level of Happiness, which can be experienced by humans in different situations. Completing, correcting, and contextualization of the existing model are the main issues addressed in this article. The proposed mathematical model is not about the same Happiness experienced by different individuals. It is about the measure of intensity level of Happiness, which is experienced by an individual in many situations. That is why the proposed model describes Happiness in a new area of research located in digital humanities, where AI can be used to continue future work. The issue related to model reflects on the possibility of translating complex issues, e.g. philosophical ones, into the language of science specifically mathematics. The definitional procedure and the contextualization of the issues of good and evil and Happiness proposed by Lem in the fable *Kobyszczę* flow from his conception of the art of writing as the art of translating literary, philosophical, or theological issues into the language of biology, chemistry, physics, mathematics, or computer science, thus contributing to the trend of considerations in the field of digital humanities and developing by use of Artificial Intelligence (AI). Consequently, an analysis of the narrative structure of the fairytale will identify the limits of applying this kind of approach to the question of translatability. Issues linking *Kobyszczę* to some of the matters being discussed in the context of artificial intelligence (AI) will also be identified.

Keywords: happiness, philosophy, literature, translatability, artificial intelligence, Stanisław Lem, the Contemplator (*Kobyszczę*)

* Copernicus Center for Interdisciplinary Studies, Krakow; e-mail: sierotowicz@gmail.com.

[1] Part one was published as Sierotowicz, Sierotowicz (2019).

INTRODUCTION

Stanisław Lem's work is an inexhaustible source of inspiration, as evidenced by in-depth academic studies, international conferences, and numerous translations available throughout almost the entire world.[2] In this context, the *Cyberiad* occupies a prominent place. However, despite the popularity of the tales contained therein, is a narrative cycle that has not been investigated very often. In the present paper that fable *Kobyszczę* will become the subject of research.[3] It is, in fact, a small monographic treatise, just like some others *Cyberiad* fables (for example, *The First Sally (A) or Trurl's Electronic Bard* is an excellent, witty, and ironic treatise on *ars poetica*; see: Lem, 1985, pp. 43–57). The fable is dedicated to Happiness, and offers an operational definition of the unit of measure of the intensity level of Happiness (Hedon), which has already become the basis for the construction of a mathematical model of intensity level of Happiness, and which will be slightly revised here.[4] The operational definition of the Hedon has been proposed in the context of the problem of Good and Evil. However, the Hedon does not solve the problem at hand, because – like any mathematical model – it cannot be applied in all cases. The main goal of this paper is an attempt to enhance the first proposition of simple model and to determine the limit of its application, with the reference to Stanisław Lem's concept of the literary work. The model presented in this paper enables the intensity of Happiness experienced by an individual in different situations to be evaluated. Consequently, this is a distinct research subject from the evaluation of the experience of the same happiness by different individuals. This is a significant research topic within the field of psychology. It would necessitate the utilisation of a specific methodological approach to resolve such research issues, given the inherent difficulty (if not impossibility) of comparing the experiences of happiness among diverse individuals.

The entire text will be divided into five sections. The first section will present a concise overview of the narrative structure of the fable under discussion. The second section will consider the mathematical model of the intensity level of Happiness. This model will be applied to a wider range of situations, including new contexts where Happiness can be experienced and its intensity level mathematically evaluated. Finally, a brief description of Lem's interpretation of a literary work will be proposed. This will be followed by an examination of the limitations of the model (section 4). The conclusion will suggest a possible interpretation of

[2] For general information on Lem's books and lemology as such, see: Lem's official site: https://lem.pl/ (accessed on 28 January 2024) and (Oramus, 2016).

[3] The fable *Kobyszczę*, as far as we know, is not included in any English edition of Lem's classic *The Cyberiad: Fables for the Cybernetic Age* (various edition; see for example Lem, 1985, 2020). This fable was however translated into English under the title "In hot pursuit of Happiness", and published separately in Lem 1973 (all references to pages in the brackets without indication of an author/year are to that edition). The term Kobyszczę is an abbreviation of the name of Trurl's machine in Polish: *Kontemplator bytu szczęsny*. The English name in Lem (1973) takes only the first part of it: the Contemplator. In the paper the term *Kobyszczę*, in italics, will always denote the Lem's fable, while the Contemplator – Trurl's machine described in the first *exemplum* (see: Table 1).

[4] It should be mentioned that *the Cyberiad* contains another fable on Happiness: "Altruizine, or A True Account of How Bonhomius the Hermetic Hermit Tried to Bring About Universal Happiness, and What Came of It", not exploited in the present paper; see: Lem, 1985, pp. 249–282.

the fable in the context of some issues related to digital humanities and the potential use of the proposed model to develop artificial intelligence (AI).

KOBYSZCZĘ – A NARRATIVE STRUCTURE OF THE FABLE

Kobyszczę is a complex narrative that assumes the structure of a classical fable, and proposes an argument *ab exemplo* in the dispute over happiness. The argument *ab exemplo* takes the form of a series of three *exempla* with the same *Ernstbedeutung*, to use Hans Lausberg's term, that is with the same intention to solve the dispute within the context of the fable. Each *exemplum* represents a distinct, autonomous, and self-contained strategy (the *Eigenbedentwig*) employed by the hero (Trurl) to resolve the quest (see: Demoen, 1997, p. 127). Each *exemplum* is introduced by a brief introductory sentence (*promythion*) and concluded by an epilogue (*epimythion*), which serves as a unifying element between the *exempla*.

It was Vladimir Propp, who in his *Morphology of the Folktale* (Propp, 1968) offered the model of the heroic quest. That model, *mutatis mutandis*, can be applied to *Kobyszczę*. In the heroic quest fable, "a hero meets a challenge – either mischief or some lack – which he is sent to overcome. Throughout the quest, he is confronted with a series of trials which require that he choose to fight rather than to yield or flee, and which finally end in victory" (Ricoeur, 1980, p. 184). That of Trurl's (who is the hero) cannot be called "a final victory", but Propp's scheme works quite well.

Following Propp, the sequence of events the hero of a fairy tale is involved in can be *prima facie* divided in four main categories: introductory sequence, body of the fable, donor sequence, and hero's return. Each category is composed of specific functions of *dramatis personae*, thirty-one in all, which describe actions or situations peculiar to a given category. The detailed study conducted by Propp made him conclude that there existed seven different fairy tale characters, or performers, of different functions (Propp, 1968, pp. 79–80). In the fable *Kobyszczę* four of them are present: the hero who undertakes a journey to solve the quest (Trurl), the donor who indicates the hero the solution (Cerebron), and a composed character which corresponds to the Propp's character "villain" in the sense that it gives a motivation to begin the hero's journey. Nevertheless, in Lem's narrative, the corresponding character (Klapaucius) cannot be considered a villain in the sense of a negative presence. Rather, he is an antagonist, even a benevolent one, as he frequently assists Trurl in finding a more appropriate way of doing things. In this context, Klapaucius can be considered a character designated by Propp as a "helper".

Now, let us have a closer look at the tale. It happened one day, late in the afternoon, that Trurl comes to visit his friend Klapaucius. Trurl, silent and preoccupied, confessed that he was increasingly convinced that he and his friend, "in all [their] long and illustrious career […] have accomplished nothing of real value" (p. 3). More specifically, never achieved "next to nothing for the Common Good" and "never once produced a state of Absolute Happiness" (p. 3). Therefore, they gained no other title but, "Charlatans of Ontology", "Subtle Sophists of Creation", but not "Abolisher of Evil". For that reason, Trurl suggests to construct, with the help of Klapaucius, "new beings, beings whose sole function and faculty was to be happy".

Their planet will then become a demonstration that "verily, attainable Happiness and never-ending harmony [is] within reach" (p. 4). Shortly, a "reign of Goodness, Love and Truth" (p. 6).

There is no need to add commentary on the eternal nature of the question posed and to recall the tragic conclusion of all attempts to make the cosmos happy. Both eminent constructors were aware of this (although Klapaucius was perhaps slightly more aware than his rival, as we shall see in due course), as is made abundantly clear in the opening argument between them. Klapaucius, "miserable agnostic, unbeliever, slave to the natural course of events" (p. 7), refuses to take part in the attempt to create the Universal Harmony inaugurating the Age of Absolute Happiness. The ironic refusal of Klapaucius poses an additional challenge to Trurl, who decides to start an experiment to fulfil the task at hand. After all, there is "a universe to save" (p. 7)!

He began with the construction of an Ecstatic Contemplator of Existence (=Kobyszczę) » a machine that rejoiced in every perceived thing. He also defined units of Happiness called "Hedons or Heds for short" (p. 10). However, a brief conversation with Klapaucius showed the limited applicability of the model. Klapaucius advanced a question: how many units "would result from this situation: one man is brutally beaten for a three hundred hours, then all at once jumps up and brains the one who was beating him?" (p. 11). Trurl began to calculate, but ironic laugh of Klapaucius gave him a stroke. Indeed, Trurl has fallen into the kind of fallacy of equivalence confounding "aesthetic ecstasy for Good" (p. 12). In fact, it is possible that an experience of Happiness could be originated from Evil. Thus, "translating" the issue into the language of mathematics and measurability does not lead to a solution of the problem, but only simplifies it, losing however from its sight the fundamental connotation of the quest. Modelling and measurability are only a small part of the issue and one cannot solve the quest only on that basis. In order to resolve the conundrum of happiness, good, and evil, one must seek an alternative solution.

Following a comprehensive examination of the nature of good and evil, Trurl determined that the inclusion of an experimental dimension would enhance the quantifiability and mathematical characterization of the subject under examination. To this end, he began to construct, or perhaps it would be better to write: create, models of civilisations. From models on a scale of 1:1 composed of a few individuals only, to models created within the framework of "experiments with microminiaturised civilisations" on a scale of 1:1,000,000 populated but many individuals. The transition stage was to plug in an intelligence component to the Contemplator. The Contemplator, as before, was enthralled by everything; however, he began to posit "why-questions", as for example why does he like everything. This led to a harsh argument with Trurl, who removed an intelligence component and locked the Contemplator in its closet (p. 20–22).

The experimental phase of Trurl's fairy-tale odyssey culminates with a series of insights into the concept of happiness, which have benefited considerably from the critical and ironic perspective of Klapaucius. First, one cannot speak of the Good where one does what one does, for there is no other way: "not he who must forever pat his fellow on the head, roar with delight and remove stumbling blocks, but he who is able to brood, to sob, to do his fellow in, yet voluntarily and cheerfully refrains from such things" (p. 15). Then Trurl discovered that Good may produce Evil, because "who is glad wishes others to be glad, glad without delay, and ends up clubbing gladness into all recalcitrants" (p. 18). Besides, "reason leads to

heartlessness, Good produces madness" (p. 20). In the end, Trurl discovered accidentally that by and large "Evil in thinking beings […] produce[s] exactly the same results as Good" (p. 29).

At this stage of his odyssey, Trurl's perspective indicated that all available evidence indicated that a reconciliation of reason and happiness was not a viable proposition. Faced with such a dilemma, Trurl decided to construct a "mental modulator to solve an existential dilemma of Happiness". It soon became apparent, however, that the computerium solving the dilemma, instead of solving the problem, began to build another computerium to which it had delegated the task, and so on *ad infinitum*. In short, Trurl built: "a Relegator and not a Calculator" (p. 31). To put an end, therefore, to pointless duplication, Trurl decided to assign each computerium "a supervisor wise beyond belief", whose task was to switch tracks from duplication to solution each time it should be necessary. Naturally, such a supervisor could be none other than Trurl himself. He therefore duplicated himself as many times as necessary so that "under the watchful eye of a legion of [informational-mathematical] Trurls everything within [mental modulator] could move at lightning speed" (p. 31).

However, towards evening, when the Natural Trurl asked the Digital Trurl how the machine was going, the Digital Trurl, recognising himself as a complete equal to the Natural Trurl, claimed that it be the other way round – i.e. that the Natural Trurl would report to the Digital Trurl. After an animated argument, the Digital Trurl revealed to the Natural one that in order to solve the problem he had founded a digital university and was also thinking of fabricating a digital copy of Klapaucius. The results achieved by the university's numerous departments, especially the Department of Theoretical Felicity, the Department of Experimental Hedonautics, the Department of Euthenical Engineering, and the School of Applied Rapture, were significant. For example, the former established that "you can render happy with next to nothing; it's intellectuals that present the problem. Intellectuals are hard to please. Without some challenge, the intellect is a wretched, pitiful vacuum; it craves obstacles. Whenever obstacles are overcome, it grows sad – goes mad. New ones must be continually provided, the commensurate with its ability" (p. 33). After much verbal skirmishes, Trurl "pulled the plug from the wall" and spent off the machine, notwithstanding the full understanding of "the enormity of what he had just done" (p. 38).

Trurl, desperate, decided to seek advice from his, and Klapaucius', late Master and Maestro Cerebron. They have had a long conversation "on the most important matter in the whole continuum, the Happiness of all sentient beings" (p. 41), during which Trurl was called "an ass", "a sluggard", "a slouch", "an intellectual dud", "a monumental dunce", "a dunderhead", and the number of his sins was classified as bordering "on aleph-aleph-infinity" (p. 49). In fact, Cerebron strongly criticised all Trurl's solutions to the problem of happiness, not only because they were wrong, but also because they lacked any reference to the history of research conducted in previous eras on the subject.

During the audience, Cerebron offered the definition of Happiness and imposed on the Natural Trurl the obligation to "resurrect his cybernetics brother", that is the Digital Trurl (p. 46). Of course, this is "a very real, and serious danger. But even that is preferable to having the traces of [Trurl's] great crime covered for ever" (p. 47). Finally, he gave a solution to the question troubling Trurl, informing him also that he had earlier discussed the same subject with Klapaucius who had this conversation in secret.

The solution goes that way: no one, neither Cerebron nor Trurl himself, "would exchange this reality for the Kingdom of Never-ending Joy". The reason for this is reasonably straightforward to discern: "a thinking being requires the impossible as well as the possible", so if one "had solved every problem, answered every question, what then? The only thing left would be to hang [oneself] out of boredom or else start punching holes in that universal Happiness" (pp. 48–49).

Following these remarks, Trurl, having been instructed to ensure the grave of Cerebron was adequately sealed (to prevent further disturbance), returned home content with the conversation and gratified by the fact that even Klapaucius had sought the Master's counsel at an earlier point in time, a detail that Trurl was previously unaware of. Only now, the reasons behind Klapaucius' scepticism regarding the project, which the former had made clear from the outset, now have become more evident.

The following Table 1 illustrates the narrative structure of the fable *Kobyszczę*.

As mentioned previously, during the donor sequence, Cerebron provides a definition of Happiness. In some sense this can be interpreted as the function 14 following Propp's approach: "the hero acquires the use of magical agent" (Propp, 1968, p. 43), in the sense that Trurl obtains the fundamental information about the problem he was trying to resolve.

That is the definition proposed by Cerebron:

> Happiness is a deflection, or more precisely an extension, of a meta-space separating a node of colinearly intentional mappings from the intentional object, with the boundary conditions specified by an omega-correlation in an alpha-dimensional, therefore non metrical, continuum of subsolic aggregates, known also as Cerebron's supergroups, which are derivatives of functional called antinominals of the Algebra of Contradictions.[5]

It appears that Lem, employing a witty and mathematically engaged style, has Cerebron express the following idea.[6] Happiness is a subjective phenomenon, and the relationship between the object that causes Happiness and the experience of Happiness itself is not susceptible to objective specification. In fact, there is an intentional object, its image in the subject, and then an intensity of Happiness. The relationship under consideration is inherently contradictory, in that what constitutes Happiness for one subject may not be the case for another. Consequently, Cerebron is correct in stating that "Happiness is not an independent function, but a second derivative" (p. 46). In the light of this, it seems futile, or even impossible, to attempt a mathematical model of the intensity level of Happiness, given that we are aware of the second derivative but we lack insight into its primitive function. Nevertheless, Cerebron's use of mathematical language invites an attempt to model this phenomenon, as he and Trurl themselves have attempted.

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[5] „Szczęście jest to ugięcie, a więc ekstensor metaprzestrzeni oddzielającej węzeł intencjonalnych kolineacyjnie odwzorowań od obiektu intencjonalnego, przy warunkach granicznych ustanowionych omega-korelacją w alfa-wymiarowym, więc […] niemetrycznym, kontinuum agregatów subsolowych, zwanych też supergrupami […] Kerebrona, [będącymi] pochodnymi funkcjonałów zwanych też antynomiałami […] Algebry Sprzeczności" (Lem, 1972, p. 482 – our translation into English).

[6] As to the mathematically engaged language of Lem see: (Głowacki, 2001; Pettersson, 2014).

Table 1. The narrative structure of *Kobyszczę*

The general categories and corresponding functions in the fable *Kobyszczę* (for further details and the numbering of functions within each category, see: Propp 1968, pp. 25–65) and *promythion*/*epimythion* of the *exempla*			**The collocation of the stage in the fable**	**Notes**
Introductory sequence: 2, 3, 6, 7 **The quest**: how to *create the Universal Harmony inaugurating the Age of Absolute Happiness, a reign of Goodness, Love and Truth* (pp. 4, 6, 7)			**The beginning** of the fable (pp. 3–7)	Hero/ Antagonist
Body of the fable: 10, 11	Promythion$_1$	*We must assemble a Someone to experience Good* (p. 9)	**The first *exemplum***: the Contemplator (pp. 7–12)	For more details see: the following section of the paper. AI issue
	Epimythion$_1$	*What a fool I was, to mistake aesthetic ecstasy for Good! Happiness – certainly, pleasure – of course! But not at someone else's expense! Not from Evil!* (p. 12)		
	Promythion$_2$	*Suppose each and every individual of a given society is plump, rosy, and full of cheer […] rushes to the aid of others with such zeal the very ground trembles […] Would not such a society be perfectly happy?* (p. 13)	**The second *exemplum***: experiments with models of civilizations (pp. 12–29)	"Maybe all this is happening in some lab?" (Szymborska, 2000, p. 248)
	Epimythion$_2$	*Evil in thinking beings […] produce[s] exactly the same results as Good* (p. 29)		
	Promythion$_3$	*If I have not the ability to change it [that the Reason is incompatible with Happiness], why, there is always mechanical aids, electronic brains, mental modulators, encephalogue computers! I shall construct one to solve this existential dilemma* (p. 30)	**The third *exemplum***: experiments with created models of civilizations (pp. 12–29)	See: the conclusion of the paper. AI issue
	Epimythion$_3$	*There can be no Virtue without Vice, no Fair without Foul, no Growth without the Grave, no Heaven without Hell* (p. 34)		
Donor sequence: 12, 14, 19 **The solution**: *a thinking being requires the impossible as well as the possible […] had [one] solved every problem, answered every question, what then? The only thing left would be to hang [oneself] out of boredom or else start punching holes in that universal Happiness* (pp. 48–49)			**The audience** granted by Cerebron (pp. 41–50)	See the conclusion of the paper. AI issue
Hero's return 20, 30			**The ending** of the fable (p. 50)	–

ON THE MATHEMATICAL MODEL OF HAPPINESS

The starting point of the first *exemplum* is Trurl's idea, that one "must assemble a Someone to experience Good*"*, because there is no Good, Evil or Happiness if not experienced. In fact, "the waterfall is neither good or evil as far as the rock is consider" (p. 9). For that reason, Trurl creates the Contemplator, the machine which "devotes itself to wholehearted, incessant observation". It was not a "passive observation", "but a most intense, strenuous and aggressive kind of observation, and whatsoever is observed fill it with inexpressible delight" (p. 11). What is more, Trurl was able to propose the operational unit of Happiness called by him Hedons or Heds, for short.

The definition thus proposed made it possible to construct a mathematical model for measuring Happiness, as physicists usually do.[7] Trurl defined Hedon in the following way: one Hed is "the quantity of bliss one would experience after walking exactly four miles with a nail in one's boot and then having the nail removed". Then, Trurl "multiplied the distance by the time and divided by the rest mass of the nail, placing the foot coefficient in brackets". In that way he succeeded in the translating the Happiness into the mathematical language, as he "expressed Happiness in centimetres, grams and seconds" (p. 10).

The definition offered by Trurl permits the elaboration of a mathematical model which represents the variable called *Happiness* (*H*) as a function of several other variables in a general situation:

$$H = C \cdot s \cdot \left(\frac{r \cdot t \cdot m}{\left(1 - \frac{d}{h}\right)^{\alpha}} \right) \tag{1}$$

where:

- H – intensity level of happiness, measured in Hedon unit,
- t – the time of walking with the nail in a boot [s],
- r – the distance covered by the person experiencing a bliss [cm] (this applies only to walking with the nail in a shoe),
- s – the foot coefficient (the Polish version reads: *współczynnik pięty zmęczonej* (= *the coefficient of a tired heel*) – Lem 1972, p. 438, i.e. the sensitivity, a dimensionless individual human characteristic in the range of 0 to 1 changing the value from total insensibility to pain $s = 0$ to absolute hypersensitivity $s = 1$),
- d – how far a nail sticks out from the sole of the shoe (i.e. how many cm the nail protrudes from the sole of the shoe penetrating into the tissue of the sole of the foot),
- h – how far a nail can penetrate into the foot (the interpretation of the variable $(1 - d/h)$ corresponds to what Trurl calls "the rest mass of the nail" (p. 10) or in Polish *zadziorność gwoździa* (Lem, 1972, p. 438),
- C – the calibrating constant that allows expressing one Hed in units specified by Trurl [cm, g, s] and ensuring the correct calibration of the mathematical model.

[7] The understanding of Happiness in this paper is very similar to the concept of Happiness as "an emotional experience based on the satisfaction, which also can be seen as an evaluation of life satisfaction. Emotion is a kind of attitude and experience about whether objective things meet their needs, and it is an individual internal factor that affects happiness" (Hang et al., 2022, following D. Kahneman approach). A mathematical model corresponding to the provided description appears to be a viable proposal.

Now, let us examine the quantified values of specific parameters in Trurl's definition (expressed in the units: cm, gram, second):

m = 60 kg = 60,000 g,
r = 4 miles = 6.4 km = 643,738 cm,
t = 1.17 hour (the average walking speed 5 km/hour = 139 cm/s for 643,738 cm) = 4,632 s,
s = 0.5 the foot coefficient (the average sensitivity to pain, expressed in absolute quantities from the interval <0, 1)),
d = 0.5 cm the length of the nail in the foot (the average value, expressed in absolute quantities from the interval <0, 1) [cm]),
h = 1 cm the total (maximum) depth at which the nail can penetrate the foot.

The value of the calibration constant C should be chosen so that equation 1 gives a value equal to 1 Hed in the paradigmatic situation described by Trurl for which coefficient $\alpha = 1$ (p. 10). Simple calculations based on equation 1, with $\alpha = 1$, give a constant C of approximately $C = 5.6 \cdot 10^{-15}$ [Hed over cm-gram-second]. Thus, the mathematical model that allows calculating the amount of ecstasy in the case of a paradigmatic situation walk with a protruding nail in a shoe is as follows:

$$H = 5.6 \cdot 10^{-15} \cdot s \cdot \left(\frac{r \cdot t \cdot m}{\left(1 - \frac{d}{h}\right)^{\alpha}} \right) \tag{2}$$

However, it can be observed that instances of happiness can be found in number of contexts. In *Kobyszczę* Trurl labels three additional situations. In the case of the Elders watching Susanna at her bath, Trurl's calculation gave the intensity level of Happiness equal to 1 kHed (the episode known as "Susanna and the Elders", in the *Book of Daniel*, chapter 13). For "a man condemned to hang out but reprieved at the last minute can experience the (joy), the calculated intensity level of Happiness was equal to 1 MHed" (p. 10), while watching Trurl's apron gave to the Contemplator an ecstasy with an average value of 15.35 Hed (let us assume that Trurl's apron is comparable to Jackson Pollock's "drip paintings"). In this way, it was possible to bring cases of purely erotic (the elders), self-preserving (a man condemned to hang but reprieved at the last minute – from now on: the *C&R situation*), and aesthetic Happiness (Pollock) situation to the same standard-walk situation described by Trurl.

Nonetheless, *Kobyszczę* offers further illustrative instances which may be employed in such an analysis. During the audience granted by Cerebron to Trurl, his Maestro reminded him, accusing Trurl of ignorance, that in "the year 10,496, Protognostor Neander described, nut for nut and bolt for bolt, exactly such a machine [as Trurl's Contemplator]" (p. 42). What is more, Cerebron himself had elaborated, many years before the Contemplator was built, "a blueprint for an Ecstastron". It was only the "foolproof type of sentient device that does nothing, but feel ten thousand time more bliss then Bromeo knew while he climbed the balcony to see his beloved" (p. 43). More, Cerebron introduced the unit of measurement of intensity level of Happiness and named it Bromeon, in honour of the great Million Shakesphere, "the great playwright of the Benightenment", who wrote a tragedy dedicated to Bromeo (p. 42).

One Bromeon corresponds the intensity level of Happiness experienced by Bromeo during the "situation of balconical rapture" (p. 44). One might consider the aforementioned event to be an example of sensual, true, and fully mutual love. Such an intense emotional state can be regarded as more profound than that experienced during the *C&R situation*. It is possible to posit that this intensity can be situated somewhere between Bromeo's case and the purely sensual happiness intensity level experienced by the Elders. This assertion is supported by the strategy employed by Fermi problems.[8] As a rule, in similar situations the geometric mean is preferred (see: Wakeham, 2021). Consequently, the intensity level of Happiness in the *C&R situation* expressed in Hed can be interpreted *prima facie* as the geometric mean of Happiness intensity level in Elders case and in the Bromeo's one. If so, for the Bromeo's case one obtains the intensity of 109 Hed (1 GHed).

And what about the pleasure of mathematical or scientific discovery or, by and large, the joy of creating something new? One of Michał Heller's book has a title: *Szczęście w przestrzeniach Banacha* (*The Happiness in the Space of Banach*; Heller, 1995). How big is the intensity level of Happiness in the case of mathematician exploring a new theorem? Or the joy of writing a poem (see: Szymborska, 2000, pp. 67–68)? In short, what is the intensity level of Happiness in these cases? An *AHA! Situation*, be it in mathematical or poetical context (Liljedahl, 2008)? Now, let us assume that the *AHA! Situation* can be considered a geometrical mean of the Pollock aesthetic case and the Elder's one, which leads to intensity level of Happiness of 124 Hed.

As indicated in Table 1, *epimythion1* is a direct consequence of Klapaucius' ironic question about the outcome of a situation in which one man is brutally beaten for three hundred hours and then suddenly retaliates by attacking his oppressor (p. 11). The assumption that three hundred hours of pain is equivalent to at least 300 hours of walking with an injured foot can be taken here as a basis for Trurl's calculation. Therefore, to this situation can be attributed the value of at least 300 Hed of a vengeance "joy".

At the end of this brief review of examples of the perception of Happiness, it is important to have a look at religious experience. For instance, we can consider the situation of a lost sheep that is found or the situation of a repented sinner (*Luke* 15:3–7). The Gospel says that the latter is the joy of the ninety-nine righteous who are already in heaven, but this joy could also be seen as equivalent to the Happiness that comes from the awareness of having been saved (*Isaiah* 25:9; *John* 20:20). It may be then reasonable to consider the Bromeo case as the geometric mean between the religious situations we have just described and the *C&R situation*. This leads to the intensity level of happiness equals to 1012 Hed.

It is, of course, challenging to compare different forms of Happiness because the experience of such states of being is subjective, and what is considered to be a state of Happiness

[8] The mention of Fermi's problems in relation to measuring happiness intensity is not coincidental. Many real-world problems that may seem impractical or impossible can be addressed by combining appropriate abstractions and approximations with common sense knowledge, similar to the strategy used to solve Fermi Problems. The latter strategy has been recently applied to address highly complex and imponderable issues, such as the wisdom-of-the-inner-crowd question, and is considered a significant challenge for artificial intelligence (AI; see Kalyan et al., 2021 and Gomilsek et al., 2024). The conclusion below explores the connection between AI and the problem of happiness.

may be experienced in dissimilar ways by different individuals. But one can ask, for example, how many miles, and how long the Elder from the Susanna's story would have to walk to obtain the same intensity level of Happiness (ecstasy) while watching Susanna or how many miles and how long the pardoned convicted would have to walk for the same joy. Having said this, the 1 Hed becomes a kind of a measuring stick (unit of measure) which permits to confront intensity levels of happiness in different situations. In order to maintain the integrity of the unit of measure, it is necessary to solve equation 2 and retain the coefficient α as the sole variable that differentiates the various situations described by Trurl. One might inquire as to the value of the exponent α in equation 3 required for a standard walk with a nail in the shoe to be as intense as the intensity level of happiness experienced by, for example, lascivious old men.

To respond to this query, it is necessary to solve the equation 2 with respect to the variable α, after substituting all other parameters. In other words, one must solve the following equation:

$$0.5 \cdot \left(\frac{1}{(0.5)^{\alpha}} \right) \tag{3}$$

In the light of this interpretation, the values of α would be indicative of the distinction between qualitatively dissimilar types of situations, thereby differentiating between different forms of ecstasy and joy. Solving equation (3) with respect to the coefficient α results in the displayed values in column 4 of Table 2.

Table 2. The relationship between values of Happiness intensity and coefficient α in various situations

Situation	Intensity of Happiness [Hed]	Calculated value of coefficient α	Coefficient α rounded to inter value
Definition of 1 [Hed]	1	1.0000	1
Pollock (an aesthetic situations)	15.35	4.9402	5
The *AHA! Situation*	124	7.9542	8
The Vengeance "joy"	300	9.2288	9
The Elders watching Susanna	1.00E+03	10.9658	11
The *C&R situation*	1.00E+06	20.9316	21
The Bromeo's case	1.00E+09	30.8974	31
Religious situations	1.00E+12	40.8631	41

In conclusion, the direct application of the model (equations 1–3) to several standard situations identified in the aesthetic, the creation/discovery, the purely erotic, the miraculous-almost saving of a life, and others, demonstrates that the proportion of happiness intensity in these situations can be expressed, respectively, by a sequence of values of coefficient

α: 1/5/8/9/11/21/31/41. The calculation of the Happiness (or ecstasy) of other situations can be effectively carried out based on the method described above, proviso that it is possible to determine the relationship of a given situation with one of the aforementioned cases of ecstasy or with the standard walk. For example, "giving a drowning person a float is similar to walking half a mile in ten minutes", and so on.

The further study of Happiness led to the formulation and identification of additional research issues. Nowadays, research takes under consideration many variables affecting the normal walking scenario. The most common variables taken under consideration can be organised into the following groups (Bohannon and Andrews, 2011; p. 184–187; Talavera-Garcia and Soria-Lara, 2015, p. 10–15); Byun et al., 2019, p. 6–8; Dempsey et al., 2022, p. 3):

- demographic (e.g. race, age, gender);
- anthropometries (e.g. legs and foot length, height, mass index);
- health condition (e.g. alcohol consumption, cigarette smoking, mean sleep duration, type of diet);
- road and walking characteristics (e.g. cadence, vertical displacement, shoe material, weather).

The above presented variables undoubtably affect walking. That is why a lot of models of walking proposed in the literature are created according the demographic, anthropometric, health condition and road and walk characteristics. It is also obvious that the variables presented above affect walking speed, which (on the other hand), is important in the paradigmatic situation of happiness. Sine these variables are not specified by Trurl, the main goal of this research is to propose the measure intensity level of happiness for a healthy average person, walking on a flat road, with good, not interfered cadence and weather. But in relation to the rest of variables, the only reasonable tool used to take them under consideration is the Occam's Razor approach. Following this approach, groups of demographic and anthropometries variables are subject to average, except gender. Considering gender in the research allows us to answer the question: if intensity level of happiness depends on gender? Bohannon and Andrews proposed the research results of normal walking speed (Bohannon and Andrews, 2011, p. 187, Table 2). Table 3 presents the average values of variables for a healthy person, with the distinction of gender, that were taken under consideration in this research.

Table 3. The calculated average gait speed affecting happiness in a paradigmatic situation

Average gait speed [cm/s]	Men	Women
$avs_{\min}$	123.2571429	115.7142857
$avs_{\max}$	140.4857143	132.3857143
$\boldsymbol{avs_{avg}}$	**131.8714286**	**124.050**

The average gait speed (Table 3) was calculated based on values presented in column 4 "Gain speed" (Bohannon and Andrews, 2011, p. 187, Table 2) for all age intervals and separately for men and women. In the next step, the average time was calculated for $r = 4$ miles = 643,738 cm

(specified by Trurl) and average gait speed presented in Table 2. The results of average time are presented in Table 4 below.

Table 4. The calculated average time of walk affecting happiness in a paradigmatic situation

Average t [s]	Men	Women
t_{min}	5222.720445	5563.164444
t_{max}	4582.228188	4862.59113
$\boldsymbol{t_{avg}}$	**4881.554761**	***5189.339782***

The results presented in Table 4 were used in equation 1 to calculate the calibrating constant C that allows expressing one Hed, separately for women and men. The results of the calculated constant C are presented in Table 5 below.

Table 5. The calculated calibrating constant C of walk affecting happiness in a paradigmatic situation (see: the equation 1) for men and women

Constant C	Men	Women
for t_{min}	4.95728E-15	4.65391E-15
for t_{max}	5.65019E-15	5.32442E-15
for t_{avg}	**5.30373E-15**	***4.98916E-15***

The results in Table 3 are average gait speed values of healthy men and women from age interval 20–99. The obtained results reveal that differences between women's and men's values of constant C (each value at the *femto* level, see: Table 5), are not substantial. That is why the intensity level of happiness was calculated in the following research steps with using the same equation 1.

The exponential equation 1–3 are similar to Stanley Steven's psychophysical power law (1957), and the relative base of an exponent includes all the information about the stimulus conditions.[9] However, this is only a first-order approximation. A more detailed discussion, based on sound anatomical data, is required to determine the values to be assigned to the variables d and h. The same applies to the variable s, in this case with reference to psychological data. Regrettably, this task cannot be addressed in this article and must be postponed to further study.

Now, let us reflect more broadly on the limits of application of the mathematical model of Happiness and Trurl's approach in its overall structure, as described in Table 1.

[9] As a matter of fact, each α value represents a distinct type of happiness, encapsulating a spectrum of experiences of varying intensity. For instance, an aesthetic experience ($\alpha \approx 5$) would include episodes such as contemplating Rembrandt paintings, cherry blossoms or mountain peaks. In a similar way the *AHA! situation* ($\alpha \approx 8$) would include a creation of the new theory of the universe or the creating of the sculpture. This interpretation of the different α values aligns with Stevens' law.

ON LEM'S CONCEPTION OF A LITERARY WORK

It seems appropriate to begin with a reference to *The Philosophy of Chance*, a book in which Lem proposes his theory of a literary work (Lem, 2014).[10] Lem's conception of a literary work takes into account not only the capacity of the work to inspire thought, but also its mode of construction, that is, the procedures and reasoning underlying its formation, which, according to Lem, are derived from science. Lem's basic idea is that a literary work prescinds from considerations of what must or cannot be the case; thus, literary studies should take an ontologically neutral stance:

> [I]n the less mature sciences, which include the humanities (and yesterday biology was still among them), philosophy is still the provider not only of general approaches but of typically specialised findings. And it is not a question of opposing one philosophical view to another, but of ontologically neutralising the field of inquiry itself, the methodology, the basic term, and the entire conceptual apparatus. For by doing so, a first step will be taken to re-individuate this respectable area in favour of empiricism. And by "respectable area", we mean literary studies (Lem, 2014, p. 26).

"Ontologically neutralising the field of inquiry" is not easy because a literary work is a complex "object" rooted in the multi-layered tissue of human culture. Nevertheless, Lem seems to support the idea that it is possible to extrapolate "a method that has been tried with success in mathematics, linguistics, anthropology, medicine, biology, technology and physics" and to transfer this method "into the realm of literary studies in the hope that it will help us explain its dark and antinomic problems" (Lem, 2014, p. 28). As to what this method entails for the conceptualisation of a literary work, Lem answers this question in the chapter VI of *The Philosophy of Chance*, titled "The work: A logical and empirical approach", where the author of *Solaris* proposes the following:

> [A]ll literary works should be considered as a certain kind of definition, namely as nominal definitions that project or create (in the logical sense) such empty names (i.e. without designators), which are the titles of these works. Since the scope of any empty name is its denotation, therefore an empty name denotes an empty set. Nevertheless, logical judgments either true or false can be made about certain empty names, although not all of them. […] By the same token, *ex ipsa ea definitione* everything that the work proclaims is logically true, however it concerns the empty name. It is because definition is nominal, that is, it concerns the connotation of an expression in language, not its denotation in real being (Lem, 2014, pp, 107–108; Lem's emphasis).

Consequently, the relation of a literary work to reality is analogous to the relation of mathematics to reality. While mathematicians construct "models", they do not know exactly of what these models represent. Each model starts from certain assumptions and progresses as an outcome of permissible transformations characterised by complex internal relations between its elements but without precisely determinable external relations to the "real world". By analogy, it can be argued that the writer also creates "models" without knowing,

[10] A fuller examination of Lem's conception of a literary work lies beyond the scope of this paper; however, see: (Markiewicz, 2007, pp. 90–98; Gomułka, 2016; Kobiela and Gomułka, 2021, pp. 297–354; Graefrath, 2022).

or needing to know, the models they produce. The resulting literary work is characterised by internal relations, while its attribution to the "real world" remains only a potential (see Lem, 2014, pp. 73–74). It is the act of reading, whether by a common reader or a professional literary critic, that establishes a set of "semantic addresses" or relations between literary and extra-literary reality. These relations can be understood as referring to those formed in the individual reception of a specific literary work or to those implied by the regulative principles of literary interpretation (see Lem, 2014, pp. 478–479).

In keeping with this understanding, Lem resolves the question of what constitutes a literary work by using a formula inspired by the procedures of logic: "literary work=nominal definition of the empty name indicated by the title" (see Lem, 2014, p. 107). Here, it is clear that Lem is translating an otherwise difficult, complex and long debated issue surrounding the definition of a literary work into a logic-based formula that allows the definition to be generalised. Many, if not all of Lem's works, are but translations of issues, problems and situations pertaining to everyday life into the language of mathematics, logic, informatics, physics, chemistry, biology, medicine, linguistics – in short, into the language of science. Let us try to look at the fairy tale *Kobyszczę* from that point of view.

LIMITS OF TRANSLATABILITY – *KOBYSZCZĘ* AS AN ARGUMENT *AB EXEMPLO*

In *Kobyszczę,* Trurl has put in motion three strategies to solve the problem of Happiness (see Table 1). However, looking on the fable as a whole, from Lem's point of view, what is the solution to the quest? What is the thesis or *pointe* of the fairy tale? Rhetoricians would say there are three *illustrans*, but the question being raised here is what is the *illustrandum* (Demoen 1997, p. 126)? In brief, *Kobyszczę* is an argument *ab exemplo*, but an argument for what? On behalf of which thesis?

Trurl's attempts to solve the problem of Good and Evil and its relation to Happiness do not lead to the definitive and clear-cut answer he intended to offer. Indeed, despite the use of a mathematical and experimental method, Trurl's "solution" seems to be consistent with what has always been known about this problem, namely that it is intractable. *Kobyszczę*, therefore, could have no other conclusion than that indicated by the inferences of Master Cerebron, which confirm this intractability. Is this the *illustrandum*? If so, it is easy to point to the limit of Trurl's method: this limit coincides with the limit of mathematical-experimental modelling.

The above conclusion sounds like a cliché since anyone with only a slight knowledge of the history of the problem knows in advance that no other conclusion than that implied by Trurl's "solution" is credible or corresponds to the human condition. But is this Lem's position? Does such an *illustrandum* exhaust the whole issue? The answer to this question must be sought by exploring the literary genre of *Kobyszczę*.

As a fairy tale, *Kobyszczę* is a good example of Lem's vision of a literary work as a strategy of translation. Imposing the veil of an allegorical and grotesque fairy tale onto the problem of Good, Evil and Happiness, Lem proposes to translate this problem into both mathematical and experimental language. This translation seems to work fairly well. It is enough to consider the

afore-mentioned mathematical model of Happiness (the first *exemplum*) or the definition of freedom as "randomness", in the technical, mathematical sense of the term, to recognise this. Indeed, at the beginning of Trurl's experimental phase, recognising the validity of Klapaucius' remarks on the compulsion to do Good, Trurl plugs into his creatures "statistical transmissions"; consequently "no one, including Trurl, could possibly foresee what they would end up doing with themselves" (p. 16; the second *exemplum* in Table 1). The translation at hand moves along a trajectory: from freedom to unpredictability to case-statistics. In fact, statistical and probability tools are needed to study the stochastic and ergodic processes that describe the evolutionary trajectory of very large and complex systems in order to portray "from outside" the behaviour of the entities that inhabit Trurl's model of civilisation (see Lem 2014, p. 29).

That being said, Lem in no way simplifies the question of freedom. Indeed, in the *Philosophy of Chance*, he writes that "the choice of any course of action presupposes the pre-existence of certain values". Obviously, "the chooser may not realise that he has chosen between values or that others have done so for him at some point, but from this it does not follow that this situation of choice and these alternative values do not exist". Consequently, it is in vain that "we want to get rid of freedom, which immediately implies a whole axiology". At the same time, Lem emphasises that "we are not condemned to science: by choosing it, just as by choosing life, we stand for a certain value. And since empiricism cannot conceive of anything in its own way with values, there will always be that remainder – which is not of the sciences – attributed to philosophy". These philosophies are "a whole conflicting multitude", which does not change the fact that there is only "one empirical reality". That the sciences are firmly rooted in this reality results in "their increasing independence from philosophy" leading to a situation in which "the philosopher is a listener who takes note of what the scientists expose". Thus, in order to avoid a "conflated plethora of metaphysics", it is necessary to move towards the "solidification of science", so that the question can be settled by experts (Lem, 2014, pp. 22–26).

While Lem thus expounds on his theory of a literary work, his understanding of the art of writing as based on the language of science seems to go in the exact opposite direction to what he has outlined, at least as far as *Kobyszczę* is considered. Trurl, after several attempts to translate the questions of Good, Evil and Happiness into the language of mathematics whereby the intensity level of Happiness can be measured, finds himself defeated and seeks advice from his master Cerebron. The renowned Master, who also approached the issue using scientific methods (p. 43–44), confirms Trurl's defeat. In his final diatribe, Cerebron states that the quest at hand cannot be definitively concluded because "a thinking being requires the impossible as well as the possible" (p. 49).

It follows that the perception of the question of Happiness and, even more profoundly, the question of Good and Evil, does not depend on the choice and realisation of one value or another, but on the continuous grappling with what is possible and impossible, the struggle with what constitutes a challenge and, indeed, a problem to be solved. In this struggle, it must be remembered that history teaches us something: The boundary between the possible and the impossible is constantly shifting, enlarging the area of the possible. In this shifting space, science plays first fiddle. Indeed, it is the path of science that is paved with problems to be solved and very often, though not always, are solved (see Laudan, 1977; Simon, 1989).

And if this is the case, then Cerebron is pointing to the path taken by science as the route to the solution to Trurl's question. Given that this is "the most important matter in the whole continuum" (Lem, 1973, p. 41), the advice to heed science remains valid for minor issues as well. This is where the real, although somewhat veiled, *illustrandum* of *Kobyszczę* appears. Here, under the guise of declaring the impossibility of arriving at an unambiguous solution to the problem, Lem seems to indicate the way to such a solution, which although attained only asymptotically, may be achievable. To put things in mathematical terms, Lem's solution seems to be this:

$$\lim_{t\to+\infty}\left(Good + Evil + Happiness\right) = \left[\,definitive\,and\,univocal\,solution\,of\,the\,problem\,\right]$$

This is naturally in sharp contrast to the approaches of many thinkers who would rather write:

$$\lim_{t\to+\infty}\left(Good + Evil + Happiness\right) = \left[\,conflated\;plethora\,of\;metaphysics\,\right] \to \left[\,\aleph_0\,\right]$$

While their formulation considers Good, Evil and Happiness as problems that can never be solved, these problems are keeping philosophy alive and perhaps even humanity as such (see Kołakowski, 2001).

Thus, returning to Lem's implicit *illustrandum*, we might conclude the following: The pursuit of a solution may take a long time, but the right way is to translate each question into the language of science. This approach coheres with Lem's conception of a literary work and its realisation in numerous of his works, including *Golem XIV* (Lem, 1984).

CONCLUSION – THE CONTEMPLATOR AND ARTIFICIAL INTELLIGENCE

As a fairy tale that addresses the problem of Good, Evil and Happiness in terms of mathematical modelling, *Kobyszczę* is instructive for considering issues pertaining to AI.[11] All the actors, including the Contemplator, are robots with superfine intelligence, which nevertheless display many human traits.[12] Three important themes emerge from this observation.

The first theme centres on the role of emotions in AI systems. As Kissinger et al. (2022) write, AI "does not feel or experience human emotions (but may mimic it)" (p. 192). This is shown in the first *exemplum* (see Table 1), where Trurl tries to teach a machine, the Contemplator, something about the varying intensity of emotions in different situations, using mathematical modelling. Trurl then tries something that today is under consideration of

[11] As to Lem's vision of AI in *Cyberiad* and his other books, see, for example (Konior, 2023; Krzanowski, Polak, 2021; Zebrowski, 2021; Oramus, 2016).

[12] As Boichenko et al. (2022) write, 'Lem creates a series of fantastic stories, the main characters of which are robots, more precisely – cybernetic creatures – Trurl and Klapaucius. They both behave quite like humans – very emotionally, constantly arguing with each other, taking offense at each other and then reconciling' (p. 3).

scientists working with AIs, namely, to teach a machine to understand emotions. Recent studies show that AIs progress "in understanding emotions and social behaviour related to social intelligence" (Sufyan et al., 2024). This progress implies a kind of information metabolism which permits AIs to learn how, in what sense, and with what strength emotions play a role in human's "decision-making mechanisms".[13]

The second theme emerges in the third *exemplum* (see Table 1). It concerns the situation in which Trurl, wanting to solve a very complex problem, creates his own digital copies, to which he entrusts both data management and the solution to the problem. Therefore, in one sense, Trurl creates an AI which "by helping [Trurl] navigate the sheer totality of digital information […] will open unprecedented vistas of knowledge and understanding" (Kissinger et al., 2022, p. 208; slightly changed). In the fable, that is what actually happens. However, this occurrence poses an ethical problem: Is it permissible to terminate an AI of this complexity? In *Kobyszczę*, the question is magnified, because Trurl makes several identical copies of himself, and as Cerebron recalls "Codex Galacticus forbids self-reproduction under pain of decommunication (Article XXVI, Section 119, Subsection X, § 5(61)" (p. 43). At this point, ethical questions concerning the human-AI relationship take centre stage, of which the third *exemplum* is but one example (see Kissinger et al., 2022, pp. 179–229; Mazur-Lejman, 2019).

Simulations conducted using an intensity model and the results of research on walking indicate that there is no significant difference in the intensity of happiness experienced by women and men. The situations considered in the formulation of the intensity model are examples of happiness. However, there are numerous other situations in which happiness can be experienced, and it cannot be excluded that these situations could be revealed by future research, specifically performed by AI.

A third theme that receives only passing attention in *Kobyszczę* but appears in other works by Lem including *The Inquest,* pertains to the confrontation between human beings and AI.[14] In *Kobyszczę,* this theme appears mainly in the context of the definition of Hedon units, which refer to human's experiences of emotions. In his short story *The Inquest* (*Rozprawa; see* Lem 1978), where Lem develops this theme, Pirx the Pilot is given the task of confronting androids (called "nonlinears", which are very similar to AIs) in order to assess the possibility of using "nonlinears" as astronauts (Oramus, 2016). In a kind of duel between a robot and a man, the Commander Pirx wins because at the moment of danger, "when an order, which was necessary under the circumstances, had to be issued", Pirx, not knowing what to do, delayed his action. An analysis of this scene would suggest "that Pirx owed his victory to the most human reflex, i.e. having doubts" (Dubiński, 2021, p. 199). In this tale, there emerges very clearly the difference between humans and "nonlinears" (AI), which highlights the issue at hand: "What is this humanity that they do not have. Perhaps it really is only the marriage of illogicality with this "good–heartedness", this "noble heart", and this primitiveness of moral reflex, which does not include the distant links of a causal chain?" (Lem, 1978, p. 323; see also Dubiński, 2021, p. 200).

[13] The concept of information metabolism is an original research project of Antoni Kępiński (see Ceklarz, 2021).
[14] For a general overview of this theme, see (Russell, 2019).

All three themes are of considerable interest to modern concerns as humanity seems to be heading towards an AI-driven future. Since this paper proposes a mathematical model to measure the intensity of happiness and can be regarded as an introduction to digital humanities, it can be used at the intersection of computing or digital technologies and humanities. It allows us to recognise and describe more precisely experiences of happiness in many situations. It thus opens a new area of research where AI can be used. In this regard, Lem's writings can be considered as a sort of mythology *ante litteram* (Polak and Krzanowski, 2022). Unfortunately, due to lack of space, the proposed prospective cannot be explored in detail in this essay.

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Submitted: 2.06.2024

Reviewed: 9.09.2024

Accepted: 23.09.2024

Published online: 31.01.2025