Research Article

Apps beyond AI for future oldster society

Introduction

Apps through the human eras

Human Societies are entering into a Fourth Age over the next two generations which will be important to conceptualize in order to create it. But before we discuss this, it is useful to consider what the past can teach us as a guide to the future. So, we first review the first three eras of modern human existence. While archeological evidence is always being updated, so the length of the first era is subject to revision, it is useful to provide demarcations of how roles transitioned in each era. Note, the reason for this is that the lessons from the past inform what we chose the transition period we appear to be evolving toward Note, some of these skill sets themes resources in the discussion of apps for oldster societies of the future. Note the term oldster is used to indicate societies that have dramatically longer lifespans than humans have had throughout most of their history, so we address questions raised by both near- and long-term aspects of this evolution. Having a society that we anticipate is one where the long-lived transition from aging as being almost a disease to aged being a condition of existence with little dilatory effects (Figure 1).

Figure 1 (a) Time magazine prediction of the longevity of natural new born; (b) man-made Humanoid Sophia made by Hansen Inc. (moved to Hong Kong) was so charming in Q/A, and was indoctrinated as a honorable citizen of Saudi Arabic.

For most of humanities existence, dominate human society was the Hunter-Gather or Wandering Age. Note, while hunter-gather societies are usually thought of as primitives, the skills for doing all of the above without a written language or the ability to store knowledge, instead requiring extensive memory techniques are quite advanced for what they had to deal with in relatively short lifespans. 30-50 years for the cycle: grandparent-parent-child-parent-…. In particular, there is a good reason for evolution of lifespans of humans to span the grandparent role in child rearing, which freed up parents to accomplish their many tasks while children were protected and nurtured. If we take a generation to be 32 years, the average for a child to reach maturity to reproduce, and live to see that child to reach the stage of becoming a parent. Then, by this measure the Wandering Age has lasted much longer than any other age to date.

The societal changes starting about 19,500 years ago world-wide began with the beginning of agriculture which led to first the formation villages & towns and eventually city states. Four skills were central to this transition from the Wander Society to the Stationary or Agricultural City State Society. Note that there is a transformation in the importance of the individuals in the tribe in this era; only kings,

John E Gray,[1] Harold Szu[2]
[1]Visiting Scholar, Res. Ord. Professor, Bio-Mech. Engineering, Catholic Univ. Am. Wash. DC, USA
[2]Bio-Mech. Engineering, Catholic Univ. Am. Wash. DC, USA

Correspondence: Harold Szu, Bio-Mech. Engineering, Catholic Univ. Am. Wash. DC, USA, Email szuharldh@gmail.com

generals, and the occasional hero are noted as history begins to be remembered because of record keeping. History, notes the occasion genius who transforms accumulated knowledge is noted in their lifetime or by history. With the exception of few individuals who do not serve the functioning of the state, the role of the individual is diminished significantly, but the tribe cannot be diminished significantly by the loss of an individual in the city state other than for the roles of king, general, or hero. Thus, the effect of the state was to reduce the role of the individual, while at the same time raising the importance of the individual because of recorded history. Note this era lasted about 610 generations, which is a dramatic downward shift to from the previous era. Also, note the number of skills dramatically increased to maintain the functionality of the state, so when codified by record keeping, the notion of an algorithmic formulation of skills could be codified in libraries. While the elements that led eventually to the functioning state are important, we would exist as we do now without them, ultimately there are three relevant to the coming era:

Written language: Accumulating knowledge both in governmental records as well as within libraries.

Algorithmic formulation of skills: Reduction of artesian skills to a series of specific steps, so procedures can be executed mechanically. (A recipe is used to create a specific desirable material is an example from a set basic starting ingredients). This is the origin of computation which increasing important in the computer age.

Abstract mathematics to formulate ideas: The rigorous formulation allows reasoning from the general to the specific (theoretical physics to prediction of observations in nature) which leads to both engineering physics so rules can be used formulate and build new and complex machines and formulates algorithms concerning the nature of the physical world.

The third age of civilization is a bit more difficult to characterize than the previous ages (which we date starting about 1500 ACE). The moveable type printing press by herdable by Gutenberg Bible in the fifteenth century allowed the mass production of books leading to ability to distribute existing knowledge in monastic libraries throughout the world, as well as the means to mass produce new books

that could explore new ideas that could not be banned by pontifical councils in Europe or Asian potentates. Thus, existing paradigms could be questioned by authors, rather than being relegated to a forgotten bookshelf or ash. Knowledge builds on knowledge; books lead to new books, encyclopedias encapsulates what is known leading tools for constructing new palaces of knowledge and understanding. The connection of observation/experiment to establishment of scientific law remains the unimpeachable means to distinguish what is fact versus opinion in science. It is our only sacred principle in science and must remain so as we try to imaginer a possible future. The second aspect of the age that was crucial to the development of the modern age is the notion of precession that is illustrated by the introduction of gunpowder into Europe from China, Gunpowder usage lead to requirements for accurately pointing and firing cannon balls. The precision requirements lead the creation of firing tables for angles to fire the canon balls, as well as the notion of a trajectory from the location of the cannon relative to the target. The feedback between beginning point to end point uncertainty is the origin of much of later what is termed statistical thinking and one of the origins of the notion of the connection between probability and uncertainty in observation. Machine implementation of manufacturing (Industrial Revolution) began in the mid-eighteenth century and continues to today. It made the consumer society possible, so scarcity of goods is rapidly becoming a thing of the past. The automotive industry is the classical model, but humans are rapidly disappearing from the loop as machines replace humans for many repetitive processes. Just as Alan Turing reduced the notion of an algorithm to a few basic procedures, so computation could be expression as algorithms being executed on a Turing machine, machine manufacturing can be translated into a similar procedure.

Thus, future manufacturing of any machine, material, or structure, can be reduced an algorithm or series of algorithm. Just as Turing proved his machine was universal, we will be able the concept of universality for manufacturing, as a fundamental principle. Establishing a fundamental principle of that translates universality to different disciplines, particularly ones that translates into consumable products for ease of use for most people could be a driving force for the next age. Note the naming of the third stage is a difficult matter; it could easily be labeled as the Scientific Age, the Communication/Information Age, or the Industrial Age. Whatever we choose to label the current age, we note it is going rapidly come to an end (lasting only 16-17 generations). So, in some logarithmic sense, the length generations for each age have decreased by an order of magnitude. What is creating this shift and what are the harbingers to come?

Shortfall: The why?

A. Individuals are reasserting their importance in society and defining what constitutes that society rather than the machinery of government or industrialists.

B. Modern medicine has extended human lifespans. A possible doubling is in the foreseeable future is likely for future generations.

C. Birth control has freed women from the burden of unwanted childbirths and it has begun to open equal roles for them to play in wider society irrespective of perceived sexual roles for participation in society.

D. We are having an aging population in most areas of the globe as well as the beginnings of a dramatic population implosion.

The notion of generational measure for humans is becoming obsolete.

E. Tools can both supplement human capabilities to help deal with the aging population (oldster apps) as well as supplement humans to augment human capability (transhumanism).

F. Ideas are becoming more important than specific knowledge, since universality implies what can be imagined, within the bounds of "engineering physics", can be implemented by some universal manufacturing process.

G. The Age of Apps and Implications for Oldsters.

The short-term consequences of the why problem points to a problem that is the consequence of population downsizing; there is no family to care for the old. Is there a technology solution to this problem other than the Soylent Green factory? 21st century technology has started down the road of "the internet of things" and the "smart home". Combining appliances with specific artificial intelligence (AI) is function well for some appliances such refrigerators and vacuum cleaners are well suited for integration into communities of elders provided some additional apps can be integrated into living units. These include: smart beds (for better adaption to sleep patterns and health monitoring), smart entertainment device which handles communications (either video or audio) outside the home, music, enhanced TV for viewing, internet access, and locomotion internal to the apartment and external to the apartment. While such devices can be made to have a high IQ relative to their function, the ability to translate communications from the human they serve remains a daunting problem. So instead of one size fits all, an alternative to augment them with the ability to communicate with an interaction device that is tuned to a specific senior resident. So, what are the attributes that are needed make such a concept workable?

Smart devices are idiot savants, so the interaction device must be able to translate communication with verbal intelligence to instructions to different savants that are unique to each one. In addition, any communication must involve feedback between each individual device to lessen errors as well providing anticipatory planning of actions. The third function required, particularly for isolated seniors with the beginning's dementia is verbal intelligence so communications is possible based on wants, desires, and to some degree the ability to *understand* what you meant to say rather than what you actually said. While current smart devices based on both neural networks and machine learning can handle the components of the smart apartment, the interaction device requires attributes that need a new approach to between woman and machine. Verbal intelligence is needed for such a device as well as emotional intelligence for such a device. In addition, the attribute of empathy is required to be a success for meaningful interactions so the device becomes a companion in the user's mind. While a human attribute for such smart humanoids, a pet image with a voice and the ability to project images might fit the bill better. Pets interact with their companion on a physical level, purring, licking a hand, waging a tail, rubbing up against you. Pets also have form of non-verbal intelligence. So, a pet companion device ideally can also interact verbally and physically with a senior companion, provide a central processing function for the savant devices in the smart house, but also be able to translate verbal commands into instructions for stationary devices, but also be able to accompany the senior when transportation guidance is needed. This companion ideally could be the perfect device for communication and maintenance of independence for Home Alone Seniors (HAS) as a supplement to nurse aids, as well

as help alleviate some aspects of loneliness by providing physical, verbal, emotional, and empathetic companion.

Anticipated results

While various types of AI exist that can provide the functionality of the smart senior community the central figure which would make this idea work is the companion. The work required to accomplish can be viewed as a fusion intelligence like that found in primates. Empathy likely is not an algorithmic, but rather a type of feedback between the senses that is linked to tactical sensations, inducing chemical reactions in the body. Humans are not just electronic devices; they are electro-chemical devices. Thus, in order to achieve the functionality, we have discussed, chemistry must be brought into the picture as well. Ants have very low IQ brains, but have high chemical communication IQ. So, while it might not be possible to imamate empathy; chemistry combined with tactile sensing, and fuzzy verbal reasoning,, might partially bypass this issue to provide a practical solution. Fusion, of the various types of intelligence mentioned here is another potential research area as well. What would an intelligence be it was equally facile in rules-based AI, neural AI, and fuzzing reasoning capabilities, and then forced by a learning functions to fuse these capabilities? It is difficult to predict, but likely something interesting and useful could occur. Soon we will need a smart humanoids with better known Intelligent Quotient (IQ) & Emotional Quotient (EQ) useful for Home Alone Seniors (HAS) nurse aids. In this paper we anticipate the future and suggest another Quality Measure called Memory & Learning (ML) to adapt to the environment. This setup may help consumers determining the cost and expectation.

Mathematically we believe ML can go beyond original designer supervised deep learning.[1,2] In other words, the humanoids can accumulate experience to perform adaptively to the emotional loneness need of Home Alone Seniors (HAS). Such an automation society we wish to label as the machine "Apps beyond AI".[3–6]

In short, Machine IQ could be divided beyond 2 Categories IQ & EQ as well as the third ML experience to match better with the consumer needs, e.g. vacuum cleaner called "Zoombot" . Such humanoids can help aging HAS society. We anticipate the science & technology will evolve more than "biped spoken humanoids" but adaptively co-existing with aging HAS, e.g. it can listen to lamenting HAS and comforting HAS with the empathy with $ML \cong IQ \cong EQ \geq 50$.

In this paper we briefly review the computational Artificial Intelligence (AI) and recommend an open "Fuzzy set Logic" with self-LM as the necessary pre-requisite quality. Let's first recall how the AI began, tracing back half century to three persons to the MIT pioneers and Cornell Univ, as well as Britain Cambridge in Figure 2.

The first Personal Computer (PC) has been introduced IBM circa 1981. Cambridge Prof. Alan Turing wished to ascertain Artificial Intelligence (AI) whether the other terminal end to be a human or not. This "yes or no" test has been recently extended into the era of modern medicine test called Double-Blind (DB) test with Negative Control (NC) (with the help of certain percentage of placebo) and Sufficient Statistics (SS) (minimizing the detrimental False Negative Rate) measurement methodology. Furthermore we mentioned the communication embodiment is empowered beyond CMOS semiconductors video imaging into current 5G millimeter carrier wave communication as follows. According to the Nyquist sampling theory, every sinusoidal wave can carry two discrete data points. We will soon adopt new communicating technology called 5G cf. Figure 3 using the "millimeter wave carrier that can carry thousand-fold

more discrete data per sec into our 5G Smartphone sensor suite. The trade0ff of less penetration can be remedied with more small-size relay antennas at land-posts or windows, etc.

Figure 2 (a). MIT Prof. Marvin Minsky introduced an" IF. Then," rule-based system; (b). Cornel Univ. Prof Frank Rosenblatt attempted computational approach one-layer opto-electronic circuitry board, kept at Smithsonian museum; (c). Alan Turing British genius giving the birth of AI called the Turing Test to determine the other side to be a man or machine.
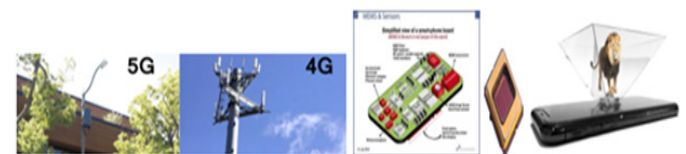
Figure 3 5G can generate a real-time hologram reveal, for example, a live-looking lion.

Certainly it can reveal human deep vein map anxiety feeling for humanoids (Figure 4)

Figure 4 The 5th Gen millimeter wave Communication will be available to improve the sensing technology for Humanoids to observe emotion of human.

Conclusion

The mathematical theory of open set has been coined by Prof. Lotfi Zadeh and Prof. Walter Freeman of UC Berkeley called the Fuzzy (set) Logic to process to concatenate adjective sets into unions of 5 open boundary sets in a set of degree of Intelligent Quotient, Emotion Quotient Q, Memory/Learning Quotient as follows.

(Dumb) (Conversation) (Smile) (Conversation) (Smart)=IQ;

(Numbness) (Understand) (Empathy) (Memory) (Experience)=EQ;

(Learning)(Memory)(Experience) (…)=M/LQ

$$(1)$$

Figure 3 Engineers may need adopt open set of fuzzy theory in Boolean sharp Logic by Prof. Lotfi A. Zadeh, EECS, UC Berkeley, Prof. Walter Freeman computing with words. Obviously, the technology development is needed in 5G areas to develop IQ, EQ, Learning/ Memory Quotient for Humanoids.

Conflicts of interest

The authors declare, that there is no conflict of interest.

Acknowledgments

References

1. Nicola Jones. Computer science: The learning machines. *Nature*. 2014;505(7482):146–8.

2. Yann LeCun, Yoshui Bengio, Geoffrey Hinton. Deep Learning. *Nature*. 2015;521:436–440.

3. Harold Szu. Natural Intelligence Neuromorphic Engineering. Elsevier. 2017. p. 1–350.

4. Szu, Foo, Chu. Artificial Neural Nets, Deep Learning & Apps. Gulf Mexico Spring School (ONR Code 321) April 16–19, Tallahassee FL, Elsevier Book. 2017.

5. Harold Szu, Lidan Miao, Hairong Qi. Unsupervised Learning at Min (Helmholtz) Free Energy. The technology algorithm has appeared in SPIE. 2007. p. 6576.

6. Lidan Miao, Hairong Qi, Harold Szu. A Maximum Entropy Approach to Unsupervised Mixed-Pixel Decomposition. *IEEE Transactions on Image Processing*. 2007;16(4):1008–1021.

Authors biography

Dr. Harold Szu has been a champion of Unsupervised Deep Learning Computational brain-style Natural Intelligence for 3 decades. He received the INNS D. Gabor Award in 1997 "for outstanding contribution to neural network applications in information sciences. He pioneered the implementations of fast simulated annealing search. He received the Eduardo R. Caianiello Award in 1999 from the Italy Academy for "elucidating and implementing a chaotic neural net as a dynamic realization for fuzzy logic membership function. Dr. Szu is a foreign academician of Russian Academy of Nonlinear Sciences for his interdisciplinary Physicist-Physiology to Learning (#135, Jan 15, 1999, St. Petersburg). He is a Fellow of American. Institute Medicine & Bio Engineering 2004 for passive spectrogram diagnoses of cancers; Fellow of IEEE (#1075,1997) for bi-sensor fusion; Fellow of Optical Society America (1995) for adaptive wavelet; Fellow of International Optical Engineering (SPIE since 1994) for neural nets; Fellow of INNS (2010) for a founding secretary and treasurer and former president of INNS. Dr Szu has graduated from the Rockefeller University 1971, as thesis student of G. E. Uhlenbeck. He became a visiting member of Institute of Advanced Studies Princeton NJ, as well as a civil servant at NRL, NSWC, ONR, and then a senior scientist at Army Night Vision Electronic Sensory Directorate, Ft. Belvoir VA over 40 years. To pay back the community, he served as research professor at AMU, GWU, and CUA, in Wash DC. Besides 640 publications, over dozen US patents, numerous books & journals (cf. researchgate.net/ profile/Harold_Szu2). Dr. Szu taught thesis students "lesson in creativity: editorial" (for individual with 4C principles and for a group by 10 rules) following a Royal Dutch tradition from Boltzmann, Ehrenfest, & Uhlenbeck (Appl. Opt. 54 Aug. 10, 2015). He has guided over 17 PhD thesis students.

John E. Gray received Bachelor of Science degrees in mathematics and physics from the University of Mississippi in Dec. 1977. He received a Master's Degree in physics from the University of Mississippi in August 1980. Additionally, he has taken electrical engineering courses from the Catholic University and physics courses from VPI. He has worked at the Naval Surface Warfare Center over thirty five years. He has worked in the areas of radar, electromagnetic, signal processing, track filtering, weapon's control systems, and guidance algorithms. He has over one hundred and forty technical publications in these areas as well as in mathematics and physics. He has chaired sessions of conferences, served on the technical, publication, and scientific committee for both national and international conferences. He has served as a referee for IEEE journals and conferences, SPIE conferences as well as other organizations. He has been invited to present papers at both national and international conferences. He has co-authored over 170 technical publications. He is a senior member of the IEEE, a member of Society for Industrial and Applied Mathematics (SIAM), a Life Member of the American Physical Society (APS), a member of Sigma Phi Sigma, and a member of the Washington Evolutionary Systems Society (WESS), and a member of the Washington Academy of Sciences.