Samu Entropy

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ESPORT AND ARTIFICIAL INTELLIGENCE

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Contents

List of Figures

Part I

Vocabulary

D

Developmental Robotics 2 Robopsychology   [DevRob2Psy]

The DevRob2Psy is the abbreviation of the Developmental Robotics 2 Robopsychology facebook group. This is an informal group wich collects the students and professors who are interested in this topic. In this group you can write comments with your own ideas: https://www.facebook.com/groups/devrob2psy/.

See Also "UDPROG".

Developmental robotics   [DevRob]

It is a scientific field which aims at studying the developmental mechanisms, architectures and constraints that allow lifelong and open-ended learning of new skills and new knowledge in embodied machines. Its basic thesis is that the robot has a body, the anti thesis of this could be a robot that only has software, the synthesis of the two was given in the PSAMU manuscript.

See Also "Robotpsychology".

E

Samu Entropy   [ESAMU]

It is quite obvious that there is a close relation between esport and artificial intelligence. This relation is further enhanced by our research which tries to focus not only on using the artificial intelligence but on creating it in a new way. Our idea is to develop a new developmental robotics and robopsychology based game called Samu Entropy as a social robot that will be implemented by software on the family's home desktop and mobile devices. https://github.com/nbatfai/SamuEntropy.

See Also "Samu".

I

IEEE Recommended Practice for Software Requirements Specifications   (SRS) [IEEE Std 830-1998]

The Software Requirements Specifications IEEE Standard. We are going to make the documentation of the Samu Entropy with this standard.

J

JIBO

The social robot of Cynthia Breazeal, see also https://www.jibo.com/

R

Robotpsyhology

The Asimov robotpsyhology in programing view https://github.com/nbatfai/Robopsychology.

S

Samu

Once the devedevelopment robotics family chatrobot, Samu Bátfai, on the other hand the collective name of our development robotics research. Also https://prezi.com/utlu1bevq9j2/egy-testetlen-fejlodesrobotikai-agens/ the presentation https://arxiv.org/abs/1511.02889 and the PSAMU manual.

See Also "ESAMU".

U

University of Debrecen   [UD]

The UD is the abbreviation of the University of Debrecen

The Yearbook of the Programmers of University of Debrecen   [UDPROG]

The University of Debrecen regular programing education and, our group in Linkedin `https://www.linkedin.com/groups/Yearbook-Programmers-University-Debrecen-7446358?homeNewMember=&gid=744635&fromEmail=&ut=2mVSHNO5Dwwm41&trk=eml-grp-sub`, which have two basis once the softwares, and the other is the yearbook.

Part II

Introduction

First of all, we present the original idea, emphasizing its interdisciplinar (e.g. esport, artificial intelligence, pedagogy, psychology, history and informatics) aspect. Then, we unfold the idea in two directions, in an expectable one, which everyone would naturally think of, and in a less implicit direction, where the game is not the (only) goal of the esport to be developed, but the intention to join the research of artificial intelligence, where the esport is not simply using the AI, but it tries to create a new quality of AI.

Chapter 1

Introduction

The original idea

We outline original idea and its implicit realization course. In the body of the document we greatyl widen the concept of the original idea and we define it not only as an esport game, but we also outline it as a nontrivial realization course, as a main part of our research plan.

The aim of the current document is to foundate the completion of the research plan

Raising the idea

The title of the idea was: „*Nothing ventured nothing gained*" e-Budapest 2024, subtitle: *esport research project proposal, „the esport is today's chess mass sport"?*

The project goals

The aims of the planned project are to establish an „own " interdisciplinar (primarily esport, artificial intelligence, pedagogy, psychology, history and informatics) esport gym and to research the opportunity of supporting the professional esportsmen (primarily regarding the physiology of esport[1] [2]

The milestones of the project

Esport

The main goal of the project is to examine several open-source computer games(typically RTS[3]), whether if they are suitable for creating and upholding a "movement" and esport duel. We'll go over the further milestones with the help of a concrete example, accordingly, we pick the 0 A. D.[4] open-source, authentical, historical RTS game.

History

Creating authentical mods[5] could be a concrete milestone, for example the Settlement of the Magyars in Hungary.

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[1] This seems to be an untouched area, which could be inserted to the otherwise strategical endeavour of the University of Debrecen, regarding health care.
[2] For example strategies, unfolding scripts, or analyzing them in the case of a given game.
[3] Real Time Strategy
[4] A 0 A. D. an open-source, real-time strategy game, https://play0ad.com/, https://github.com/0ad/0ad/.
[5] An actual mod is for example the one about the Han dynasty: http://www.moddb.com/mods/rote, https://github.com/0ADMods/han_china.

Pedagogy, psychology

In the context of the education system the (typically children-based) target audience of the game would naturally raise pedagogical and pychological questions.

The physiology of esport

The examined questions regarding the mentioned target audience are important on their own, but could their examination be profitable regarding the support of the professional players? The research of the extreme strain of the professional players, the support (for example classical physiological) of the players could be a direct natural goal. Examining mass sport (and its thought or real „you always stare at the monitor" abuse) is interesting, too.

Promotion and building society

If there is occasion, regaring the gym that is being introduced, the most promising game could be a „non-official"[6] game of Budapest 2024.

Artificial Intelligence

The actual Google Deepmind's article (regarding Atari [7]) that was released in the Nature journal opened a hot topic in the research of artificial intelligence. Observing and joining to that is entirely natural and important.

A probable realization

The vertical research direction built on the 0 A. D. game or on any similar one is a probable (standard) realizational direction , in which we could make the said esport, artificial intelligence, pedagogical, psychological, historical and informatical goals real with a pretty good chance, but – or accordingly – we outline another, a less predictable but more ambitional solution direction in the next chapter.

Esport and artificial intelligence

An unexpected realization

The Holy Grail of game developing (and usually of software developing) is the search of „Killer Apps"[8]These apps are rare by their very nature, developing a killer app with an expected realization is impossible. Of course, this would be equally true for an unexpected realizational direction because killer apps are not developed directly, but an app can become one, IF it can.

In this case – at least in the research – we can bravely try to „redeem the world". For this, first let us examine why we like playing games and whether if we could develop an artificial intelligence with an esport game. In other words, we define artificial intelligence neither as the controlling process of the plaer nor as controll of the gameplay, but as the creation of a new intelligent lifeform. This is now of course an entirely intuitive goal, so let the lifeform to be created mean anything for now.

Why do we like playing?

Our physical body lives in the „disordered" molecular world of chemistry, but as a living system it is able to increase and maintain its internal order (in other words to grow up and to preserve its temporary consistency during its life) in this world.[9] We can

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[6] The title non-official tries to imply that the game to be introduced would not be an olympic sport :), but it could be naturally a possible step in this direction. In any case, we could mention that accepting esport as an olympic sport (for example in the case of Rio) is a hot topic in the news(see for example the "League of Legends" game).

[7] https://storage.googleapis.com/deepmind-data/assets/papers/DeepMindNature14236Paper.pdf

[8] To picture the „killer app" concept we could mention the Doom PC game or the Facebook social site.

[9] See Erwin Schrödinger's, What is life? : the physical aspect of the living cell, Cambridge University Press, 1944 and Roger Penrose's, A császár új elméje Számítógépek, gondolkodás és a fizika törvényei, Akadémiai, Budapest, 1993.

assume that this attribute is „inherited" by our mental functionings in the following meaning: they are able to see the order in the noisy input, perceived by our sensory organs and this is called: reality. *Our thesis is that we enjoy playing because this way we can improve the internal order of the game, inside the game.*

I can confirm this thesis or just illustrate it only relying on my subjective experiences and the conversations between me and my chilren. For example organising (building) the empty world given by the 0 A.D. offers in my opinion a great gaming experience. This can be seen in the screenshot below.

Figure 1.1: Screenshot of a gameplay of the author(red on the map) played in the 0 A .D. game's han_china mod.

Under gaming experience we mean that creators of the game basically coded an experience with the game itself, which the gamers can decode, in other words, which they can live through.[10].

Futhermore, there were certain ages among my children, when they did not want to battle, but to build (positioning the new buildings and „maxing„ in-game characters given by the increasing level of the Town hall). During this time, in the Minecraft Minecraft® game[11] its survival mode offered exactly this experience,[12] with its free building option.

We mention the Clash of Clans® game[13] as a spectacular example for increasing organization, where the gaming experience is similar. If the reader plays this game, then he/she can see for himself/herself (for example by searching for the „Bátfai clan" clan) that the change of „th"-s[14] shows well the increasing complexity of the villages in the game's world, the increase in the organization can be seen if we look at the villages of the clan members (in order of their rank in the clan, which roughly correlates with the time spent with playing).

Family robotics and game

We raised the idea of developing a JIBO-like developmental robotics (Samu) application earlier, that runs on the family PC and is equipped with mobile device sensory organs earlier, and it is part of our DevRob2Spy research plans.[15]But there was one thing that the project lacked: why would anyone use it in the family? An answer to this could be the game!

The receipt

- Let us give the modell of the machine that knows how to increase its inner organization[16].

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[10] Regarding this, see the following publication: Bátfai Norbert, Bátfai Erika, A mobil játékfejlesztés elméleti és gyakorlati momentumai, Híradástechnika, 5, 34-37, 2005, http://www.hiradastechnika.hu/data/upload/file/2005/2005_5/HT_0505-7.pdf.

[11] https://minecraft.net/

[12] More precisely the game's „eternal life„ mode, where one can build freely and does not have to fear anything.

[13] http://supercell.com/en/games/clashofclans/

[14] Ez a Town Hall szintjének rövidítése.

[15] See the Samu as a social robot for the family's home desktop research topic an the N. Bátfai, R. Besenczi, Robopsychology Manifesto: Samu in His Prenatal Development submitted manuscript.

[16] This is unfortunately a step that cannot be pre-planned (after Dénes Gábor: this needs to be invented first :) See the Norbert Bátfai, The Fractal Nature of Algorithms https://github.com/nbatfai/AlgorithmicFractals c. manuscript.

- This model will be realized in the form of a "JIBO-like developmental robotics (Samu) application earlier, that runs on the family PC and is equipped with mobile device sensory organs".

- The visual interface of the inner structure of the application could be the foundation of a game.

The gaming experience

In this we make an attempt to dream the gaming experience. We would build it from two fundamental parts:

- the game needs to have a part that increases organization

- and a social part.

In the meantime, let the goal of the game be to enhance Samu's (in other worlds the „ developmental robotical learning machine ") vision and hearing.[17]

Inventing the part that increases organization is harder because it depends on the 1st point of the previous point. („Let us give the modell of the machine that knows how to increase its inner organization"), which is in itself is a big scientific challange... so we can make intuitive analogies at best:

- If the definition of the „entropy decreaser machine" in question were similar to the definition of the Turing machine, then we could visualize the definition analogically to the GoDNGoD game plan. (In the mentioned game we breed types based on the Turing machine's definition, for example the "Breedi Turingi" or the "Turingus Tri Breedus"-t, see the Norbert Bátfai, Turing's Imitation Game has been Improved, http://arxiv.org/abs/1509.00584 manuscript).

- If the seeing (hearing) realization of Samu's sensory organs used more hidden layered neural architecture, then we could give a visual language [18] with which the gamers could tune the architecture. For example if this neural architecture was based on the Google DeepMind's TensorFlow [19](which is for example able to generate C++ source code from „visual language") then developing a „more playful front-end" language could be a research milestone. If this option was viable, then the game could be the player's own digital lifeforms' „brains" organization, which could give the given lifeform a better vision. On the social level that builds on this, these lifeforms could either „fight" to decide who sees better or co-operate, where two players would „recombine" their creatures and where the question would be: which creature sees better.

- Although we could continue this „brain storming", we don't do it here.

Risks

It goes without saying that the „unexpected" direction is basic research and includes many pitfalls, which could detain the setting and realization of used research goals, not to mention the experimental development that could be built on top of the used research.

Conclusion

For starters, we outlined an esport research plan including the actual Budapest 2024 sportdiplomatical efforts, and we dreamed this plan further to basic and used research directions. While we placed a hard-core artificial intelligence research focus in the basic research direction.

If we succeed in searching resources for the research, it is worth working side by side on both the „probable" and the „unexpected" directions because the first one being a used research entices by concrete results.

Without support only the basic research is recommended.

We will embed our developmental robotical and robotpsychological researches within the esport conception outlined in this document.

We will call the „probable" research direction *Samu Standard* and the „unexpected" direction *Samu Entropy*

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[17] Only in an intuitive manner can we mention our reasearches regarding this topic. For example for "vision": https://github.com/nbatfai/SamuCam, and for "hearing": https://github.com/nbatfai/SamuVocab.

[18] As a thought-provoker see for example the language for the earlier LEGO Mindstorms® developed by the media labor of the MIT, Fred G. Martin, The Art of LEGO Design, The Robotics Practitioner: The Journal for Robot Builders, 1(2), 1995. http://www.kipr.org/sites/default/files/artoflego.pdf.

[19] https://www.tensorflow.org/

Part III

Research Plan

In this part we will create the research plan of the *Samu Entropy*.

It is quite obvious that there is a close relation between esport and artificial intelligence. This relation is further enhanced by our research which tries to focus not only on using the artificial intelligence but on creating it in a new way. Our idea is to develop a new developmental robotics and robopsychology based game called Samu Entropy as a social robot that will be implemented by software on the family's home desktop and mobile devices. See also: https://github.com/nbatfai/SamuEntropy.

The task of this part is to choose the development of the esport game, and then support of the SRS documentation.

Chapter 2

Introduction

Introduction

Many times it seemed that create artifical inteligence is available, but the it was not succesfull. But our expectations are fatted up by the resoult of the Google DeepMind. Sam is also part of this inspiration and aspiration in this direction, but it might be useless. And now we are not concentrate to Samu, but also see things from different perspectives: our dream is an e-sport where the purpose is to create an artifical inteligence species where the species meaning something intuitive.

Samu Entropy

In this point we have to dream the game! To gain some experience we create fast and disposable prototypes.

Where does the game take place? On the Earth. When? Today.

The Family

The basic design of this game is the family. The family means that group which can take care of a Samu agent. The Family (inside the game) can be a real family, group of friends, society of a university course, but also a single human player.

In architectural meaning the family is the brain of the agent (for example it is a programme which run on PC or Notebook) which has sensors and moving parts.

In functional meaning the brain do the calculations and the managing of the mobile sensors and moving parts. The mobile camera of the human player is the eye and the GPS is an other sense-organ. The player takes the phone and Samu can walk with the player through this methods. We think about it that the brain is in something and what is happening, the player can find the place with GPS and take photo from the scene. See also later Matyi the hunter.

⚠️ **Family is the architectural frame**
Intuitively think that the family of concepts developed in-game captures the architecture outlined above.

Main use cases

The next use cases are not specify a concrete game, but only gave directions to appoint (which they should try to achieve a developed specific games), then Rapid prototyping introduced specific point games. These use cases represent the archetypes developed applications.

Samu, the brain

This will include a bunch of programs for machine learning algorithm implementations.

Gréta, the builder

This will include a bunch of programs that provide a visual interface to the point of agent Sam programs. It is important that these programs increase the orderliness and they must provide gaming experience.

Nándi, the teacher

This will include a bunch of programs that provide supervised learning.

Matyi, the hunter

This will include a bunch of programs that perception and movement implemented (if applicable such as geocaching geocaching basis).

Erika, the warrior

This will include a bunch of programs that seek as esport can operate.

⚠ **Why Erika, the warrioris a good program?**
Intuitively think that it can be projected onto a large play arenas, like a big boxing match in the main gala. So we do not think of a typical quiz game here ... You can be a great gaming experience, you can look good!

Norbi, the chief of staff

This will include a bunch of server-side programs that are implemented by management for families and brainbattles.

Educational and research plans

In these tasks the students and the teachers work together. The actual student can complete these tasks, in these UDPROG (DevRob2Psy, UDRFT) facebook groups, and in this sense these tasks can be used in education.

The way of the tasks solution:

i. Fork this https://github.com/nbatfai/SamuEntropy project!

ii. Make your own solution in your fork!

iii. Send a pull-request! (The active UDPROG students can earn points by completing these tasks, if your pull request will merege you can earn more bonus points :)

Rapid prototyping

Here are ideas and their implementation. Fontos, hogy megfeleljenek a Main use cases point in Gréta, Nándi, Matyi, Erika. This is a kind of brain storming point, but so much more to a specific game should outline ideas for which he can be really fast prototype to achieve a rapid prototypes and tested in this game experience.

It is worth highlighting the emerging features in the brainstorm to see if they can be applied to other games.

(!) **Meta-feature: ONE BRAIN RULE THEM ALL!**
It can be quite an interesting way to choose not the best prototype for the implementation(SRS docs etc.) but if it works as in the Main use cases under the heading Gréta, Nándi, Matyi, Erika archtype segmented, then with the change of the brain the players could choose in which game to participate.

Samu Family Album[1].

The essence of this game is the face recognition[2].

Every player who is a member of a family takes a photo of themselves and of their other family members and other non-players too.

Samu

The developed agent tasked with identifying faces (the faces of their own and other families). In this implementation we use the Google's TensorFlow package. This is a typical PC application.

Gréta

The function of the Samu implementation developed in TensorFlow, that we will be able to provide graphical user interface for the better gaming experience and monitoring the TensorFlow datastream.

Nándi

The function of this program that learn datas which belongs to the owner of the picture(for example whose face is in the photo, and the expressed feelings).

If in the „Matyi" function the player creates photo during the hunt, then the human „Nándi teacher" teaches the brain to check if the player's photo is real.

Matyi

The developed program's task is to record the face pictures and the related data. For example, the server signs if there is a registrated player nearby (OpenStreetMap and or Google Maps visualization) , or reachable via Bluetooth (or something, software recognise outsider organizer signs by the player, let's say bar- or QR code bracelet, brooch, even NFC sticker etc.), then they change faces and datas.

(!) **Feature: collecting bits**
A player is prompted to meet, because they will get bits! Usually we try the ingame cash, matching fund, goodness, etc. define in information or bits.
For example, the hunter takes a relative frequency at the meetings(With X x_1 times, with Y y_1 times, etc. till with unfamiliar I met many times). Based on this, at the next meeting, they will get as many bits as much is the entropy of „with whom I met" (which they will only get if it was predicted etc.).

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[1] For work title: FACE BATTLE (FaBa).

[2] We use the camera for the face recognition (See also the SamuCam projects) it means that the pictures are connected to a person (it means his/her account) or feelings(happy, sad).

It is important to take pictures only about faces, because of this fact, try out in the face photo maker Android app Android Mobile Vision API. In the PC app, we can start from the code used in SamuCam (there is a web camera or the phone just in an IP webcam function and we used OpenCV).

⚠ **It works with photos**
In the mentioned SamuCam program, we could see that the face recognition teaching with photos goes perfectly (not the learning, but the teaching :) for example, see this video: https://youtu.be/6cRbyKrq45c

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Erika

In a battle, two families struggle to measure up their power (knowledge). Profile picture of, let's say, 5-5 (private players) toss the frequency associated with, and after these short learning, the other brain has to recognize the family's other photos, if they are listed in the person-in-five, if so, which one, etc. (A quasi-11 duel basis and the results are measured in bits, based on the prediction entropy).

The winning family will get the knowledge of the defeated one, or for a given time, the defeated family shares the later taken information's parts to the other player.

The name of the battle is: brain battle[3].

Concrete app ideas

Norbi

The serverside's task is the „Samu is the brain" organisation of families and brain battles on PC.

A server represents a tribe, the relationship of tribes and families is 1:N natured. So one tribe can have several families. The registration of the family into a tribe can be initiated on the Samu brain client by a player in a given case.

Design a communication protocoll for these cases, use the Google Protocol Buffers

  i. Norbi's and Samu's relationship: Norbi ensures rows, depending on Samu's bitnumbers[4] for the Gréta, Nándi, Matyi and Erika family members for the pictures and their following metadata sharing.

   Create profile, for example.: picture, name, entropy[5], GPS at registration etc.

  ii. Relationship between Norbi and Gréta : The Gréta client downloads the Samu brain neural architecture, for editing.

  iii. Relationship between Norbi and Nándi: the Nándi client downloads the pictures and informations that were „hunted" by Matyi.

  iv. Relationship between Norbi and Matyi: the Matyi client uploads what he „hunted" the pictures and the informations.

  v. Relationship between two Samu through Norbi: the sharing information between two brain independet to the result of the battle.

  vi. Relationship between Norbi and Erika: manage the brain battle!

  vii. Relationship between two Norbi: battle of tribes, we are not working on for now, when the developing in one tribe will be ok, then it will be addressed!

Samu

Create a face recogniser case study, using the TensorFlow (the C++ API)[6]

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[3] For giving this name, special thanks to Bendegúz Mátyás Bátfai.

[4] The family's „goodness" is measured in bits, we will say that my family is 64 kilobyte, 3 giga and so on.

[5] See the Feature: collecting bits note, which explains, how many points the player has.

[6] See also the https://www.tensorflow.org/versions/r0.10/tutorials/image_recognition/index.html tutorial.

Gréta

Nándi

Matyi

Going out from the previously mentioned SamuCam, make a PC C++ case study, which marks out the face from the living picture, see the previously linked SamuCam demo video!

Using the previously mentioned Android Mobile Vision API, create an Android case study, which marks out the face from the living picture.

Erika

Gaming experience and visualization experiments

    i. Samu Amoba: asks from the Norbi server about the Samu brain and players from the family and on OpenStreetMap draws and amoba, where „" is the brain's GPS coordinates, on the middle the foothills the family's players registrational (or hunting) GPS coordinates. (you can go out from Raxicab rcwin viewer according to the OSM drawing , don't care about network communication, the family's GPS coordinates must be in the code, but of course should work as usual, the in UDPROG community 420 points, mustn't appear in the fork of SamuEntropy, just max. own repository, for example from Raxicab forked, introduction on Facebook).

Samu OOCWC Fight

This concrete game's main point is that OOCWC[7] RTS edition.

Samu DevRob Vision

This concrete game's main point is the development of vision should be modelled, starting from an 1x1 pixel eye going to ???x???.

Samu Custom RTS

This concrete game's main point is that in 0 A. D. RTS we leave to the brain to control certain parts of the empire.

Tasks and challanges

Logos

Place the forks into the `docs/res/logo` library. A png is needed, an svg variant and a license! As an example take a look at The logo created by Márton Vona Robocar Championship OOCWC logo.

    i. Create a new logo for the Samu Entropy. (240 point in UDPROG society)

Thanksgiving

Thank you to my children Bátfai Mátyás Bendegúz, Bátfai Nándor Benjámin and Bátfai Margaréta Niobé for the great brain battles which created Samu Entropy.

Translators.

Gergő Bogacsovics, János Pogány, Attila Fodor.

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[7] Different editions: Police and the Raxicab.

Chapter 3

Index