Proposal: Alter ego nets for human augmentation (A draft)

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Abstract

A system for modeling human perception is proposed for development. The system is based on a new introduced algorithmic model for human perception of objects. In this model the perception is represented by two interacting iterative cycles, resembling respectively the forward and backward propagation executed at training convolution neural network. The process of perception is modeled as a human's communication with the perceived object that functions like a neural network answering the user's requests ('forward' iterations). On the other hand, the perception includes the 'online' training of the network representing the perceived object ('backward' iterations). In this way perception by person of an apple is seen as an online learning of a network 'apple' and a simultaneous person's 'dialog' with the network. We call this perception model the 'alterego' net.

The forward iterations reflect 'internal world' of a human and thus may be tuned (transfer learning) to a specific person. At the same time the backward iterations yield the percept (internal representation) of the felt object. In this way tuning the alter ego nets to a specific person or group of persons, will allow simulation of their perception.

In particular it will enable generation of the content approximating the internal human's representation of the perceived objects. Thereby the alterego nets is potentially a new human augmentation technology allowing various applications.

Contents

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1 The DuWheel scheme

1.1 Perception of object as a sequence of 'forward' iterations

We consider images of art, symbolic images, mental images the person interacts with etc. We refer to them, without further specifying, the ART objects. For our proposal we have selected several ART images allowing better explanation of our model.

Our claim is that perception of the ART objects is iterations. Consider Figure 1, where hammer and sickle are depicted and the following perception example. Consider the following 'dialog' between the person and the object. A person unconsciously generates a sequence of words (notions), reflecting its internal 'state'. These may be seen as unconscious to a certain extend thoughts of the person: 'street view', 'weather', ... We call this the general semantic steam associated with the person. The words are send to the ART object, compared with the words/notions associated with the ART object, yielding a word/notion output, that is sent back to the person. The inputs which are not relevant w.r.t. the ART object do not receive the response.

In out example, the person at some iteration step generates $x1$ = 'wanna going for a walk', due to, say, his aspiration. The $x1$ is compared with the words/notions properly associated with the object. And the object 'replies': $x2$ = 'You are going to collective work to help the motherland!' The $x2$ is

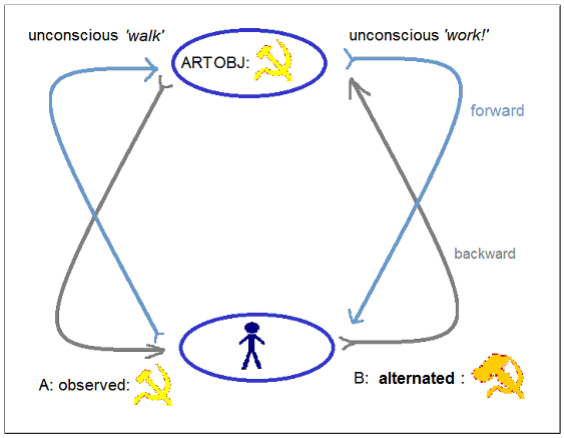

Figure 1: Example of du-wheel scheme: perception of an emblem is a sequence of [unconscious] iterations with the person. From this point of view, the *percept*,as the final result of perceiving, does not exist. Perceiving is essentially the non-stop iterations.

embedding to the sequence of words generated by the person. Ans the iterations continue.

As these iterations the perceived object is a 'constant' function: receives input and outputs the response. By analogy with the deep learning notation we call these iterations forward.

In the next section we consider how the properties of the perceived objects are changed, in other words, how actually the ART objects are constructed

1.2 Alternation of the perceived object's properties at 'backward' iterations

Actual object perception is not iterations with the constant ART object - sending and received the data from the object - but something more compound. It seems to include in itself alternation of the perceived object. In this section we consider two examples, in the next describe the DuWheel scheme of the object updating perception. The operations under consideration resemble the 'forward' and 'backward' that of deep learning, thus we will use this notation.

Refer again to the 'forward' loop (Figure 1). What happens when the ART's output 'work!' come into collision with the person's expectations?

The subject of the person's attention became not internal experiences but the ART object *itself*. The 'work!' begins to be considered as an attribute of the object. The person as if starts reevaluating of the object with a new attribute And the whole set of the properties of ART is updated according to the new attribute. As the result, we may receive an updated ART object with new properties. For example with a new property "forced labor" replacing the

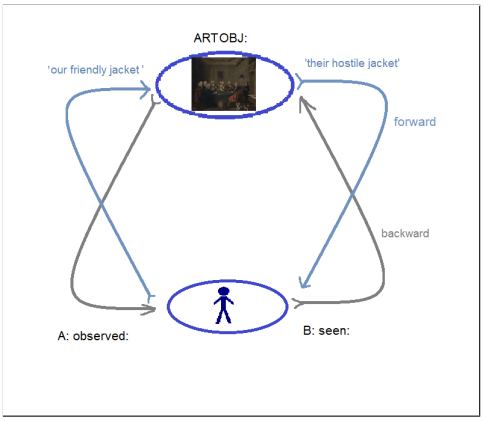

Figure 2: Raw scheme [3]

old "free labor" property.

Another example is shown in Figure 2.

Suppose we are summoned to a commission that should deal with our case, it known a priori the decision solution may not depend, but may highly depend on the commission's bias, for us or against. [1] The person does not know and hesitates. We start our considerations with forward iterations reflecting the current state of the person. The mental sequence appears: 'they', 'they are kind to us', 'this city light is friendly to us', 'look, they have the same jacket as we have', 'this is a deeply friendly jacket', etc. With some interval, elements of the sequence are verified (iterated) with the (ART) image of the commission and returned to the person (like 'walk' $\rightarrow$ 'work' above). This is illustrated at Figure 4 where the elements of the mental sequence are depicted as green rectangles and the elements returned from the ATR object as blue. In our scenario, 'this is a deeply friendly jacket' is sent to the ART object. And suddenly we obtain the element that is not alligned with our sequence, say, we obtain 'we do not know whether the the jacket is friendly to us' reaction.

At this moment the forward iterations are interrupted, and we switch to the 'backward' iterations, where the object of our consideration become the ART image itself. One may tell the goal of the backward stage is alternation of the properties of the ART object itself. The alternation is induced by evaluation of 'jacketness' properties w.r.t. the ART object .

We begin reevaluating of the object with a new attribute 'the jacket toothy and hostile to us'. We consider a stream - sequence of words/notions refereed to the ART object. We call this the object specific semantic steam (OS3). This stream represents the properties of the ART object, similarly to how the general semantic stream represents the internal human's states.

Among them there are the elements associated with the 'jacket' notion. For

[1] this resembles some person's real experience at the oral entrance examination for MSU Faculty of Mechanics and Mathematics in the past

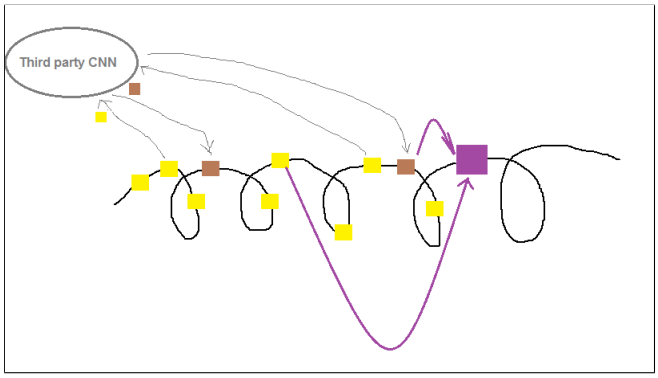

Figure 3: OS3 streamer

example: 'commission', 'people', 'came against us', 'jacket', 'the jacket was just a trick', 'the jacket does not matter', 'they want to frighten us with their uniform', 'the hostile unity of their jackets', ... Some elements are verified versus the ART object using the third party tools like CNN nets for localization and classification of the objects in the scene. This is shown at Figure 3, where the brown rectangles returned from the tool represent new informative element added to the OS3 stream. For example, given an element 'we do not know whether the the jacket is friendly to us' the tool return 'non friendly jacket' element. Actual change of the ART object properties is in what may be called selective summarization - selection of small set of notions consistent with subsets of the stream. For example ('non friendly jacket') and ('my predecessor has suffered from the commission') leads to 'non friendly commission for me' (shown as violet rectangle).

1.3 Comparison of dual loops.

The properties of the introduced DuWheel loops are summarized in Table 1.

Activity:	**'forward': calulation of the values of the function**	**'backward': alternation of the function itself**
Direction:	clockwise	counter-clockwise
Updated object:	The person's states	The whole ART object:
Examples of the processed objects:	walk → work	mill → giant; friendly commission → hostile commission
Examples of the processed objects at creation of ART object:		'sea' → 'Black sea, orating, nears me, resolute, And thunders by my headboard, loud and rough' [2]
Transformation:		conversion of observed (input) content to the seen (?)
Streamer name:	general semantic streamer = support + interleaving stream	object specific semantic streamer = support + interleaving stream
Support stream	a sequence of associations for a person's paradigm	a sequence of associations object properties
Interleaving stream	responses from the object to the support stream	responses from the 3-rd party net to the support stream
Associated terms:	inhale, passive	exhale, active

Table 1: The dual loops: comparison

2 The alterego nets

The alterego nets model the human object perception and allow generation of the content approximating the *perceived* by the persons. The nets are based on the Duwheel scheme introduced in section 1. Below we describe the suggested algorithmic implementations of the scheme for the forward and backward it-

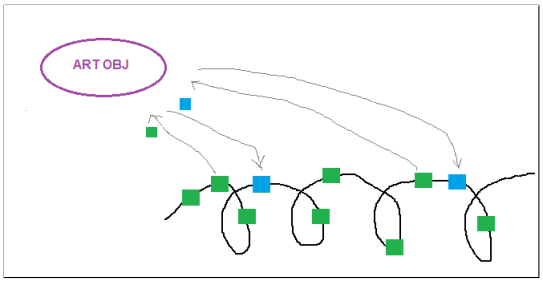

Figure 4: GSS streameR is comprised of support (green) and interleaving (blue) streams

erations. At the forward iterations a set of internal human states is updated using the outputs returned by the net representing the perceived object. At the backward iterations alternated are the properties of the net.

Further we discuss the nature of content generated by alterego nets, and outsketch their personalization.

2.1 General semantic streamer (GSS): generation of the internal word description

The *general semantic streamer* (GSS) approximates 'stream of consciousness' of a person that includes the responses obtained from the ART object. One may tell the GSS addresses a person itself.

The GSS is a sequence of words (notions) w_i representing the person's current state, the notions at closer positions are associated in a greater degree. The GSS is comprised of the support and interleaving stream. The former consists of highly associated notions, for example 'they', 'they are kind to us', 'this city light is friendly to us' (Section 1.2). The association may be implemented as dictionary [3]. The answers received from the ART object form an interleaved stream consisting of elements inserted to the support stream. The elements are read from the ART object as described in section 1.1. These may contadict ('walk' *rightarrow* 'work') or be in accordance with the support stream ('friendly jacket'). After insertion they operates as a support stream yielding associated notions. Reference to Figure 4.

2.2 Object specific semantic streamer (OS3): generation of textual object description

An object specific semantic streamer (OS3) is a stream of words (notions) describing the properties of the ART object. It's stucture is similar to that of GSS. Th OS3 is comprised of the support stream interleaved with the answers about the ART objects obtained from the third party CNN nets. The support

[3] it seems literature texts like James Joyce's are suitable

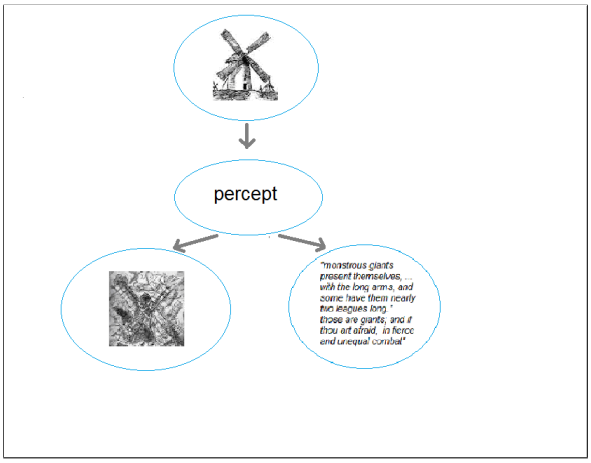

Figure 5:

stream a sequence of words (notions) related to the perceived object, e.g. 'stipe', 'mushroom', ... (Section 1.2). Reference to 7. The elements of the stream may be built using the dictionaries. The intreleaving stream consists of the third perty answers like: "is mushrum is somewhere in the image?", "which objects are in the image", "are the people of the image friendly to us?". The difference between support streams of OS3 and GSS is in what one may call selective summarization: selection of small set of notions consistent with subsets of the stream. [4]. For example ('non friendly jacket') and ('my predecessor suffered from the commission') leads to 'non friendly commission'. Selective summarization results in updating the textual representation of the percept of the ART object. It is depicted by violet square at Figure 3 and as "alternated" object in Figure 1.

2.3 Generation of the representation of the *perceived*

It is time now to clarify the notation. The perceived object (stimulus) is given in some modality: visual or textual. Reference to Figure 5. We call the internal person representation of the perceived object the *percept* ([5]). We do not know its modality, we can not tell much about it, but we may represent it by a certain media, for example, a visual image, or a text. In this paper we deal with textual media, - namely OS3 is textual representation of the percept.

People perceive the world differently. Even observing the same content. For example some people experience in the image of Figure 6 (A) the percept that is represented verbally at Figure 6 (C). And some people not. Like this, the *perceived* is being different from the observed, may be different for different people.

[4]This may be seen as a kind of compression

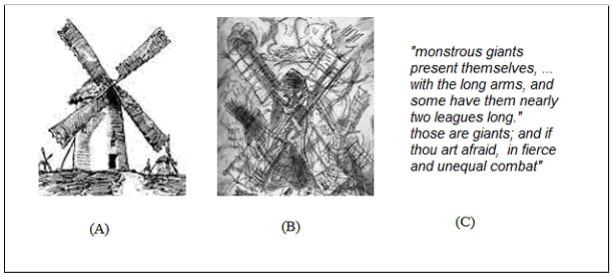

Figure 6: An alterego net may simulate perception of Don Quixote in the episode with windmills. (A): an input image [2] (B): visual representation of the perceived image of giants [2] (C): textual representation of the perceived [1] The alterego nets will be trained on the image pairs like (A,B) and (A,C)

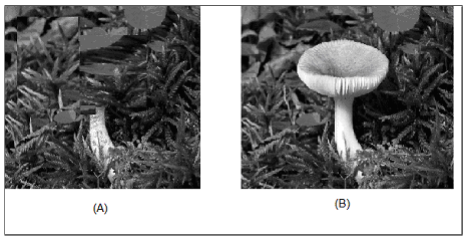

Figure 7: (A)- observed image (B) - visualization of textual representation of the perceived object
An alternative approach (not 'deep dream') allow to obtain 'mushrum' within the image.

Ability to approximate the perceived by the persons is essential for human augmentation applications. The alterego nets give this ability: the textual object description (section 2.2) represents the *perceived*! This is the *object* describing content because the OS3 is generated per object. And this is *person derived* content because the OS3 is the result of interaction with the GSS that reflects the internal world of the person.

It is worth to note that the content generated by the nets described in this article is essentially the textual representation like shown at Figure 6 (C) and not the visual representation like shown at Figure 6 (B).

2.4 Personalized alterego nets

The main application of alterego nets will be personalized alterego nets considered below.

Tuning the alter ego nets to a person or group of persons (personalization) will allow generation of the content representing that percept of a person or group of persons.

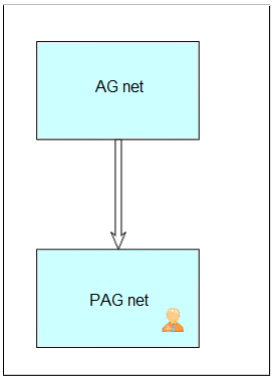

Figure 8: PAG Net

An alterego net may be fine tuned for a given person concerning the content input/output of the person. We call this the personalization of the alterego net. This may be done for a group of of persons also. Reference to 8

The AG nets will be trained so that their generated content will approximate the *perceived* of the respective person. In this way, the alterego nets will allow tight modeling and classification of the respective human's perception. Thus the AG nets as an technological advance w.r.t. 'static' person's profile.

These may be learned analysis of user feedbacks.

In this way, tuning the alter ego nets to a specific person or group of persons (transfer learning), will enable generation of the content representing the percepts of the subjects. In such a way, the alterego nets is actually a human augmentation. These will allow new applications, like analysis of the perceived human content, generation of the book summaries 'per person', etc.

3 Conclusions

We introduced the nets for generation of the *perceived* that is essentially the textual description of the input content. Enabling the alterego nets the ability to generate the perceived image of the same modality as the input image, like shown Figure 6 (B) in the topic of the further research.

4 Appendix

```
mu of percept:
    cho-to un-modal. To chto ne text, ne vis.
    no to cto predstavlyem by vis

    percept of internal states
    percept of the object


    no mu eto predstavlyem
        by text
        by vis

to chto my delaem v os3:
    my predstavlyem [dinamicheskiy] percept
    by text representations
    =
    old: seen na perceived. "

    mozno li neformalno nazvat
    textual representation of the percept
    kotoruy textom ne yavlyaetsa:
    "TextualPercept"

chto takoe: visual repr
    to ze samoe kak textual

---------  OPEN ISSUE 1 ---------

chto takoe see v A smusle
    v sluchae input = image
    eto "VisualPercept"
    THAT IS EMBEDDED?
    THAT IS CLOSETO INPUT?

---------  OPEN ISSUE 2 ---------

iterations: videnno e/uvidennoe
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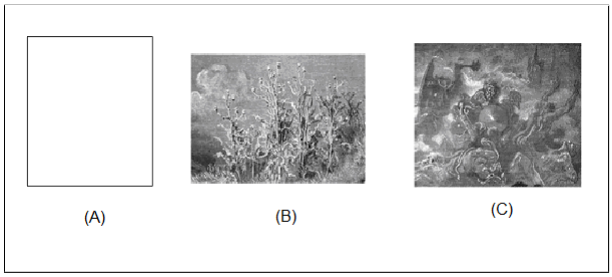

Figure 9: (B): observed [4] (C): seen [6]

Another example is a net whose input is a scene and the visual representation of the percept is the scene with the embedded image of the object that has been recognized, (Figure 7) The OS3 stream includes the summarization object 'mushrum' derived from 'stipe' (section **??**).

The alterego nets are different by:

- semantic level. The net with input 7 A and output 7 1 B is of low level. The net with input 6 A and output 6 B is of high level.
- domain modality. Image domains may be high o low semantic levels. Language domains are of high level.
- observed input may be empty/non empty. 9 (A) and Table 1.

4.1 Multi-subject alterego nets

We have considered A one-subject Alterego nets.

Now consider a simplest situation: given is a set S of words representing some subjects, eg S='movie', 'Paganini', 'Uruguay'...

Run duwheels schemes for the notions.

4.2 Remarks on DuWheel scheme

- **duality of DuWheel scheme** The DuWheel scheme of Figure 1 is from the point of view of a person. We may see to this scheme as from the point of view of the ART object.
- **meaning of forward/backward computation** Ref to Figure 10. (B) is a generalization of (A) with empty input
- **meaning of forward/backward computation** Ref to Figure 10. The x2 of (B) may be conscious or unconscious
- **meaning of forward/backward computation** Ref to Figure 10. May we treat any object as iterative?

- In English: observed VS seen. The Russian allows better expression of this duality: videnoe VS uvidennoe.

4.3 Further development of DuWheel scheme: estetically efficient samples

The DuWheel scheme which models human perception of aesthetically efficient samples.

TBD

4.4 Comparison with deep dream approach

TBD

4.5 OLD SCHEME: Training the alterego nets

Training/Testing example is a pair (observed, seen). Alterego nets will be trained on content pairs as (A,B) or (A,C) of Figure 6. Visual and textt data are different in that the textual alterego net may be trained at very small (eg one) number of examples. For visual data .... to 'blind inpainting'. For textual data the interpretation model is a graph that reflects relations (interactions) between the meanings of words, sounds (probably, also, and letters) comprising aesthetically efficient patterns **??**. The model may be tuned on at a single example like the shown in 2.

4.5.1 Training the visual alterego nets

For visual images the net is trained on pairs of Figure 6 A, B. The trained net should given Figure 9 A or B yield the image similar to Figure 9 C.

4.5.2 Training the textual alterego nets

One may explain this effect as follows. These short phrase include a few mutually interacting meanings, the interaction affects the human. The meanings exists at several levels. At low level, interacted are the meanings associated with the letters. At high level, interact the meanings of the words. It is worth to emphasize the low meanings interact with these of high level. The process is similar to perception of visual forms, where detected low level primitives (edges) are interacted with detected high level ones , and the whole process is simultaneously bottom-up and top-down.

Humans learn EE at very small number of examples. For example, a new tuple may be output given one EE example (imitation of an input text, Table 2). We may train a alterego net in similar fashion using model of EE with free parameters. The model describes relations between the elements of different semanic levels. The parameters may be trained given very small number of 'positive' examples. Learning the model parameters resembles learning the NN

layers coefficients. [Similarity score for candidates is determined by inexact graph ismorpism.???]

For NLP images the alterego net is the net whose input is fixed and is a dictionary of English words. The output is a series of EE triplets. The net will be trained to 'tell' new EE triplets. Collections of high-level literature texts will be used in the training

4.6 NLP: hierarchy of creativity

The hierarchy of creativity is summarized in Table 2

Level	Learning Example		Evaluation example		Remark	
	Observed	Seen	Observed	Seen		
0	–	Rain Steam speed	–	rain steam speed	repetition	
1	–	rain steam speed	–	gypsum summer faint	imitation	
1	–	the mountains of the far shore swimming in a sunset haze	–	Half-drunk switchman in a red semaphore cap	Creative imitation of specific text	Vladimir Nabokov
2	–	Large text collection	–	Half-drunk switchman in a red semaphore cap	Creative imitation of non-specified text	
3	–	Large text collection	–	Two roads diverged in a wood and I - I took the one less traveled by, and that has made all the difference.	Creation of a new text.	Robert Frost

Table 2: hierarchy of creativity. Machine given learning example, the machine is able to produce evaluation example.

4.7 Remarks

- **learninngh at small number of examples** Another application of IP nets is that these will may allow creation of highly personalized user content (adversarial, news, summarization).

- **learninngh at small number of examples** Uchitsya eto ne kopirovat. Dle EE ya mogu buold similar (DPS→GLO). Ya postroil sililar. Ya mogu tak ze similat to obuchoy kakrtinke. Ponyatie similarity drugoe VS EE object is a net. Kogdauchimsya. DElaem TL.(TL et postroenie simil net) Possibility to learn machine at very small number of examples is property of textual data. OBJECTION!: ee paintings

- **terms:** rotam, dual circular flow,Pentium dual rotam, dual circular stream,dual circular flow, circuit, round, cycle,dual chart, dual wheel

- **Question** The alterego net is the creation of ART object? Or the alterego net is the of ART object?

- **Question** The alterego net is the creation of ART object? May ART obj be the internet?

- **IDEA** IDEYA. TO CHTO VOOBSHE EVERY USER IS NET.

- **Question** Ok, every user is net. Chto dast seen conent¿? nu,mozem access it, ispolzovat dlya klassifikatcii. Dali Lozky/ Kak vidit lozku. Kakuyu chochet. Kupit ne kupit,

- **Question** chto izvlech is du schemu krome EE construction? Answered. See thge next item below

- **Question** Kak du scheem svazane s AE net? Otvet:Dobavlyaem loops dlya vsech vozmoznuch objects

- **Question:Why the alterego net simulating person (P) is better then profile information associated with (P)?** chto izvlech is du schemu krome EE construction? Answered. See thge next item below The alterego net exposes approximation to the internal world of P, that should be much more powerful then the profile. Contextually, the output of alterego nets is highly associative/intelligent media .... //why better that plain text?//

  1)mozet sami po sebe budut silnee: transfer from intelligence accumulated in the trextsa 2)bolee polnaya simultion of a person. mshiva napevaet kva kva kva. Mozno observe associativnue relations nu current content

- **Difference from summarization** The texts like shown Figure 6 (C) differ from text summarizations of the image (D). The (C) resembles but is not summarization of (A). Also, the (B) resembles but is not (A).

- Difference from deep dream

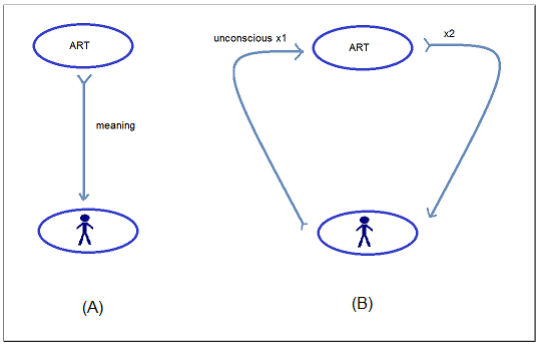

Figure 10: Art object is actually not a object (A) but a cyclic iteration with a person (B).

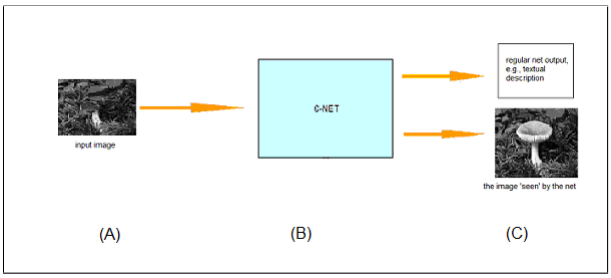

Figure 11: (B): observed (C): alterego net

- DU WHEEL SIMULATES HUMAN PERCEPTION
- **DU WHEEL as GAN**
- The mentioned third party CNN may be a part of 'close box' solution

usr: download27122015@gmail.com pw: q3409r543098

References

[1] from `http://www.online-literature.com/cervantes/don_quixote/12/`

[2] a modified image from `https://www.google.com/search?as_st=y&tbm=isch&as_q=don+quixote+and+the+windmills&as_epq=&as_oq=&as_eq=&cr=&as_sitesearch=&safe=images&tbs=sur:fmc`

[3] At Figure 2 the 'A Club of Gentlemen by Joseph Highmore' is used as an illustration

[4] The modified image from `https://commons.wikimedia.org/wiki/File:Don_Quixote_4.jpg`

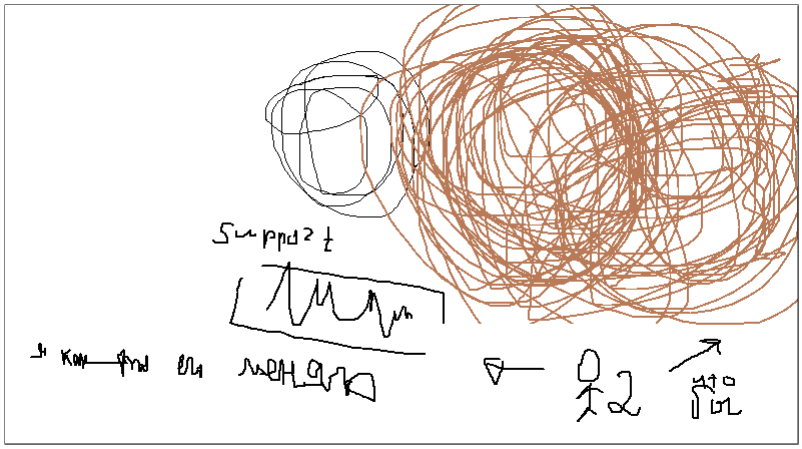

Figure 12:

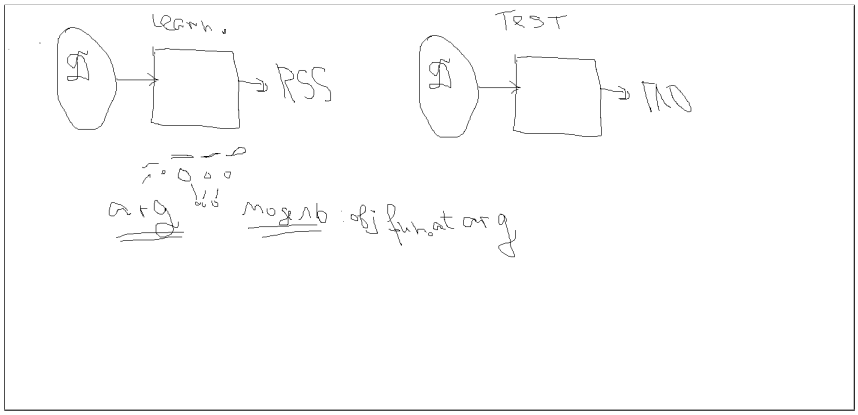

Figure 13:

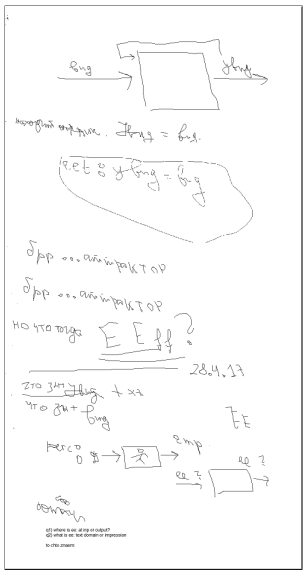

Figure 14:

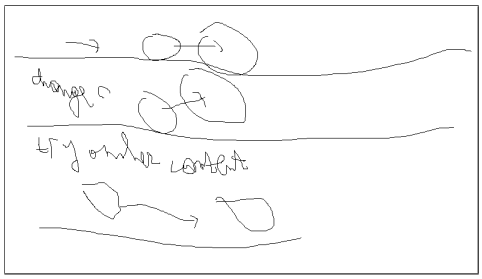

Figure 15:

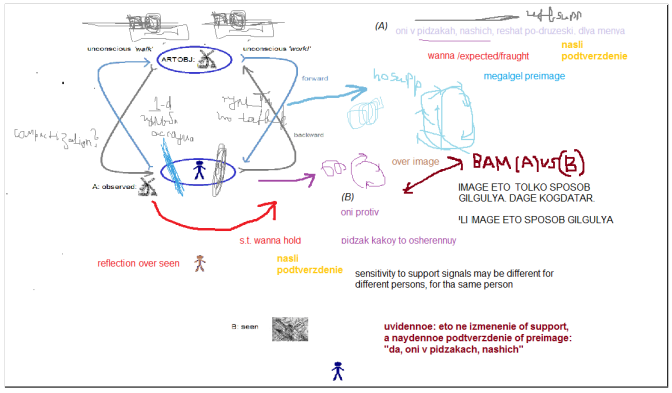

Figure 16:

[5] https://en.wikipedia.org/wiki/Perception

[6] The modified image from https://commons.wikimedia.org/wiki/File:Don_Quixote_2.jpg