

Conceiving, developing and representing a conversational-actor agent Acting paradigm and theatrical dialog

1. Summary

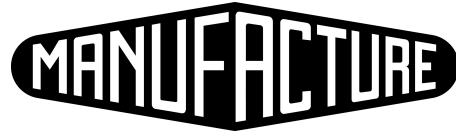
A conversational agent is a computer application, which strives to imitate the interactions of a dialog with a human being. In the wake of research on artificial intelligence, many agents are currently in use or under development. Yet, performing arts seized this tool very little, even though, historically, theatre is a practice centred on the fact of saying a text. This project aims to conceive, develop and represent a conversational agent on the model of an actor improvising from a text. Using a precise and time-tested acting technique, following some active analysis, we suggest a team of actors and computer scientists work together on the modelling of the behaviour of an actor while he is acting, in order to convert it in an algorithmic translation, relayed to a conversational agent.

Inherited from an exercise by Stanislavski, active analysis involves, for an actor, to redial (redesign) a theatrical text he does not know yet word-for-word: having an incomplete knowledge of the text, he acts by fragments, sometimes with his own words. The method, which may apply on very different texts, supplies furthermore quite a few practical tools, which allow, at least in part, an algorithmic translation. We suggest an iterative process, consisting in a passing of the tools of active analysis to computer scientists, a development of a test conversational agent and a dialog of actors with this agent, in order to conceive, step by step, an actor which would be a conversational agent.

The algorithmic translation is achieved in AIML language: in a XML syntax, it allows the formalization of key words (or group of words) which, once they are detected by the agent in the entry of the user-viewer, produce a fixed answer, possibly in the given context of a discussion, linked to previous exchanges. In the paradigm of functional programming (and no longer procedural programming), the AIML language enables to work, on the one hand, on a symbolic reduction in language (collecting the different ways of saying the same thing) and on the other hand to formalise acting dynamics specific to the actor, such as the management of different situations (contexts) and of tools of active analysis which allow to recompose the text by fragments.

The project proposes furthermore the development of an interaction device (of a dialog), in writing, with the conversational agent, via existing messaging systems (SMS, Messenger, WhatsApp, etc.). This device will be accessible to all. Each of these interactions (conversations) can be considered as a different interpretation of the reference text. All these interpretations (completed simultaneously by the conversational agent, with different user-viewers) can then be represented on stage, in front of a collectively assembled public. Here, we shall ask actors to act as different user-viewers, live (thanks to a headset transmitting the text that needs to be said), in confrontation with the conversational agent, acting as itself with the help of a voice synthesis.

This project, deliberately thought of as being interdisciplinary, wishes to shift the paradigms of the conception of a AI, thanks to the acting tools specific to theatre. The aim is to create a tension on stage between the presence of an actor and an artificial presence.



2. State of the art

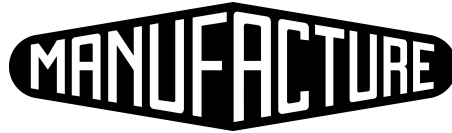
Most researches in the field of artificial intelligence are articulated around conversational agents, which try to imitate the interactions of a dialogue with a human being and hence pass successfully the Turing test (Turing, 1950). Thus, after the invention of ELIZA (Weizenbaum 1966), simulating a psychotherapist in 1965, and its evolution into ALICE (Wallace 2003), many conversational agents are currently being developed. Recently, after Google suggested an agent stemming from a Deep Learning program processing film subtitles (Vinyals 2015), Microsoft launched Tay on Twitter in 2016. Tay was able to learn from interactions with the users (Griffin 2016), while Eugenia Kuyda's Replika offered a companion agent, more willing to listen to the interlocutor than to talk of itself (Pardes 2012). This experiment is getting closer to the utopia of an AI such as the film *Her* (Jonze, 2013) displays: capable of feelings and emotions (or, at least, to simulate them), up to the point of falling in love with her partner. In video games, conversational agents are today often called upon for very short interactions with the players. This way, they rejuvenate the paradigms of interaction between the spectator and the machine, as well as the paradigm of storytelling (Perlin 1996, Riedl 2006). The most advanced experiment is probably that of Event[0], which centres its whole game principle on such a dialogue. According to the relationship (friendly, confrontational, neutral, etc.) that the player forges with an AI responsible for a given spatial capsule, a progression will be enabled (or not), leading to information and the discovery of new places, meaning a progression in the game (Mohov 2015).

Less explicitly referenced in terms of AI, *Lifeline* or *To be or not to be* (2014) have put forward narratives on the basis of decisional trees, in which the player-viewer can, at each step of the game, make a choice between different decisions and hence behave on the future narrative.

In performing arts, the works seeking to seize or to deflect the implications of AI seem to have less focused on theatrical dialog than on the representation of robotic presences, in the perspective of putting it into tension with a human otherness (Castellucci 2002, Lepage 2016, Hirata 2010). And if the humanoid robots of Hirata talked effectively among themselves on stage, the text they were saying had been written upstream by a human author, instead of being a self-sufficient production. Yet historically, and particularly so in the 20th century, the theatre is a practice centred on speech. Theatrical action lies in the fact of saying a text, to oneself, to a partner or to an audience. One can, however quote Annie Dorsen; she staged two conversational agents, represented on stage by two computers. They were re-enacting and recomposing in real time the dialog¹ between Foucault and Chomsky on language (*Hello Hi There*, 2010). A few years later, she created a device in which an artificial intelligence staged the Shakespearian text of *Hamlet*, by taking over video projections, lights, music and a text vocally synthesized (*A piece of work*, 2013). Lastly, Maxime Carbonneau or Piotr Mirowski work on establishing a dialog or an improvisation between an actor and a conversational agent, but on very short interactions (mostly written in advance on Siri, 2016). These happen in imprecise contexts inherited from the configurations of Theatresports, which determine in advance a generic acting situation (location of the scene, theme, etc., see Mirowski 2018).

If live entertainment seems to get little hold over the tools of AI, quite a few research studies derived from AI have however tried to rely on the expertise of actors, in order to model their improvisation techniques. The idea is to then

¹ M. Foucault, N. Chomsky, *De la nature humaine, justice et contre pouvoir*, Paris, Ed. de l'Herne, 2007



lead to a comparable improvisation of a conversational agent in the environment of interactive pedagogical games (IPD : see Si 2005, Zhang 2007, Magerko 2011). (Johnson-Laird 2002) shows in this perspective that the improvisation capacity of a conversational agent can be seen as a real-time resolution task of problems. These studies point two tensions: on the one hand, there is the wish of preserving a precise and coherent narrative while maintaining an interaction with the user-viewer and, on the other hand, the difficulty to understand precisely the different mechanisms at stake when an actor is acting – thus a difficulty to formalise them. This project, intentionally interdisciplinary, wishes to offer a new paradigm of improvisation for a conversational agent, in a perspective centred on the text (from a theatrical text), by relying on an acting technique, more precise than free improvisation.

3. Description of the project

3.1. Objectives

The project's main objective is to develop a prototype of artificial intelligence capable of behaving like an actor – that is to say, concerning the theatrical text – to play it in interaction with human partners (actors or spectators). We place ourselves willingly in a paradigm of a text-centred theatre and we consider this “artificial actor” like a conversational agent, namely a computer software that receives a textual message (written or oral) that can be “interpreted” in the double sense of the word: the “meaning” is first extracted, then a suitable answer (written or oral) is “played” in relation to this meaning. The objective is the triple:

- first of all, propose an algorithmic translation, in a certain computer language, of the playing dynamic specific to the actor for conceiving and developing a dedicated conversational agent. This means researching how and up to what point it is possible to formalise the different operations performed by the actor, who play and improvise starting from a theatre text for implementing them in a conversational agent;
- Then, propose a device allowing to a human partner (actor or spectator) to react, in other words to converse, to talk, and thus to “play” with the agent. As the conversational agent treats, *in fine*, textual information (words or group of words), we propose a written (and not oral) interaction. This allows us going beyond the issues related to a prior transposition of the voice in writing². (“Speech to Text”). We think especially to the devices accessible on the mobile phones connected to a type of platform like SMS, Facebook Messenger, etc. Given the computing capacity available, the difference with the human actor is that the conversational agent is capable of managing simultaneously a large number of interactions (of the order of a thousand) with different partners. The challenge is here of creating a multiplicity of simultaneous interactions, which are the “interpretations” of the text of reference.
- Finally, it's about designing a stage device allowing the scenic representation of all these simultaneous interactions, in front of the public. Here we propose to the actors to play the role of different users, in confrontation with the conversational agent.

3.2. Method

² These issues can make the object of a future research.

MANUFACTURE

In order to achieve an algorithmic translation of the activities of the actor's art, we suggest to rely on an existing method for acting. This method is the Active Analysis, developed by Konstantin Stanislavski at the end of the 1930's at the Moscow Art Theatre (MAT), then expanded by Maria Knebel (Knebel 2006) and more recently by Anatoli Vassiliev, in Moscow and in France (Vassiliev 2007). This method consists, for the actor, in recomposing (redesigning) a theatrical text that he discovers after a couple of readings and that he does not yet know in a word for word manner, but that he reshapes via its meaning and implications. In this way, via a partial knowledge of the reference text, the actor plays it by fragments, and what he plays does not correspond exactly to the original text: he tries to get closer to it, and the acting arises in the gap that exists between what appears and the original text. The method delivers a number of practical tools (see § 2.3) that can apply on very different texts.

The premise of this step involves the transmission to computer scientists, by some actors, of the tools of active analysis they usually use in order act. In return, the computer scientists will translate into an algorithm all or part of these tools in order to generate a conversational agent. They will submit the agent hence developed to the actors, who can then act with it (by writing) as they would with a partner. The actors will provide feedback to the computer scientists who can then iteratively bring changes to the agent.

The idea is to conceive ultimately a generic application which – once the tools of active analysis translated under an algorithmic form and taking a theatrical text as a basis – can generate semi-automatically a conversational agent able to render this text by fragments (see the next paragraph). Indeed, the method of active analysis obliges one to know a reference composition (plan) of the text that will be staged. Thus, the process cannot be totally automatized and needs a prior stage of analysis and of structuring of the text. This work, essential for each text, will be carried out by the actors in a studio, in parallel with the different stages of development of the agent.

With the help of dedicated applications, we suggest to link this kind of conversational agent to digital messaging tools such as SMS, Facebook Messenger, WhatsApp, etc., including mobile terminals, and hence to offer interfaces to different interlocutors-viewers, available on a 24 hour/7 day basis. Each can then, individually, build his own conversation, under a written and interactive form, with the conversational agent.

This device allows the production of a set of simultaneous interpretations with the same conversational agent, each one being unreachable to an exterior viewer. The scope of the last stage of the project is to show on stage the “live” event of all these interpretations.

In this perspective, the method consists in considering this set as a new theatrical text. The different written interactions between interlocutors-viewers and the agent are considered like fragments of a new representation that wants to be staged. We shall suggest a device, in which the human actors will play the role (the text) of the different interlocutors-viewers while they are in an interaction with the agent, which will play its own role. With the help of Text-to-Speech (TTS) technologies, it will indeed be possible to convert, in real time, each message written by a spectator to the agent under the form of audio information. The latter will be transmitted, by headset, to a human actor who will then be able to act this message, as he would do ordinarily.

The same TTS technology will allow the conversational agent to play his own role. The scope is thus to enable – simultaneously and in real time – the set of interactions happening between each spectator and the agent to play



together in the same space and time. The human actors hence become live avatars of different interlocutors-viewers, a priori invisible: they give them body and voice in a representation space, which is real this time. They are disposed in a situation of interaction with an acoustic entity (perhaps plastic, or at least, featured in the space) whose only possible action consists in a voice that responds to the human actor. This device offers a tensioning of the immateriality of a computer application and of the bodies and voices of live actors.

3.3. Approach

Main tools of active analysis used for the algorithmic translation of the conversational agent:

- Inner monologues: according to active analysis, each dialogue scene is at first structured into a series of autonomous monologues (one per character), which then are confronted. It is hence possible at any moment to model the words of a character as a monolog, independent of the others.
- Composition: “plan” eventually rearranged in a text: the repeated practice of active analysis enables the actors to segment each scene in different parts, then to relate them. The sections are transferred as such to the conversational agent.
- In the composition thus cleared, two acting modalities are alternatively possible:

. A psychological system of acting: the actor tries to identify the event, the situation that initiates the scene, the motives of the character. In his acting, he tries to develop the consequences of this original event. In this modality, the acting paradigm for the agent consists in trying to conciliate this information with a situation, which exists in the reference text. Indeed, the information (stemmed from the text) will have been submitted by the spectator to the conversational agent. Its task is hence to find in the text the paragraph, which matches most the situation submitted by the interlocutor-viewer. The agent then answers by playing this reference situation, that is to say, formulates a (textual) answer, which develops and extends the situation (i.e.: by building an answer from the following replicas in the text).

. a ludic system of acting: the actor tries to identify what event ends the scene, an event towards which the whole action is reaching, the event that drives the scene. He tries to attain this event and is attracted by it. In this modality, it is possible, thanks to the composition, to draw a model of different decisive *events* (extracted from the text). These events either determine the choice of one replica of the text or another, either, once triggered, make the action advance to a later stage, with a change of scene, for instance.

In order to translate these tools in terms of algorithms, we suggest to use the AIML language: in a XML syntax, it allows the formalisation of keywords (or groups of words) which, once they are detected by the agent in the entry of the user, generate a fixed answer, eventually in a dedicated context (Wallace 2003). The AIML formalisation enables two layers of study:

. The symbolic reduction of language, which, through a series of (eventually recursive) treatments, enable a clustering between different formulations of a same idea under a same entry.

. The formalisation of an acting dynamic specific to the actor: managing different contexts (hence different situations), a progression in the soliloquy storyline and the playful structure, etc.

The use of the AIML language takes firstly place in a functional paradigm: the conversation agent is modelled as a



set of functions, which call one to another until a final result. The recursion (the fact that a function can draw upon itself) is at the heart of this paradigm and allows to break free from a procedural modelling (also called imperative, see Hudak 1989). The latter, because it imposes a sequentiality of treatments (series of instructions), seems to us too constraining and restrictive in comparison with the complexity of the actor's art. On the contrary, a functional modelling enables one to diverge from the kind of model of the finite-state machines (which are at the foundation of the procedural programming and iterative treatment) and to get closer to the dynamics of acting specific to active analysis. These allow the artificial actor to recompose the reference text, at each interaction, independently of the state he is in.

3.4. Expected results

This project will enable the precise and detailed formalisation of different acting techniques stemming from active analysis: to this day, we mostly have writings and reports of experiences that describe situations of an actor at work. It will then provide the conception and the development of a computer application able to generate semi-automatically a conversational agent, taking a theatrical text as a basis, as well as a graphical interface and a preparatory work from the actors (working in active analysis). It will hence be possible to generate, in a reduced span of time, new agents. The project will also propose an acting device linked to messaging systems (SMS, Messenger, etc.) in order to allow several interlocutors-viewers to dialog through writing with the conversational agent. Lastly, we will suggest a stage device in which the actors will play, in real time, with the conversational agent.

3.5. Role of the members of the team

Before starting the work with the actors, the IT developer will propose elementary treatments of symbolic reduction of the language, as well as the interface tools linked to the messaging systems and the solution Text-to-Speech (TTS). The applicant will direct the actors while they improvise, with the tools of active analysis, on fragments of scenes. The application, the designer and the IT developer will observe the work (which is recorded by the assistant of the research) then do assumptions of algorithmic translation of the operations completed by the actors while exchanging with them. The IT developer includes these translations to the conversational agent. It is then submitted to the actors for a test while they are acting. Depending on the feedback of the entire team, the algorithmic translations are iteratively modified. The treatments of symbolic reduction, of interface to the messaging systems and TTS will be, at the same time, defined.

4. Risks and gains

Because of the inherent complexity of the actor's art and the treatments of symbolic reduction of natural speech (AIML), it is likely that the conversational agent will not behave exactly as an actor would do: errors of understanding and of meaning will happen, and there will be a certain variability in the acting dynamics between a human actor and the agent. However, the scope of this project is not that much of making the agent pass the Turing test successfully than to use the techniques of actors in order to renew the paradigms of conception of a AI.

BibliographyArtificial Intelligence

- GRIFFIN Andrew *Tay tweets: Microsoft creates bizarre Twitter robot for people to chat to*, The Independent, (March 23, 2016).
- HUDAK Paul, *Conception, evolution, and application of functional programming languages*, ACM Computing Surveys, vol. 21, no 3, septembre 1989, p. 359-411
- JOHNSON-AIRD, P. N. *How jazz musicians improvise*, Music Perception 19(3):415–442, 2002
- MIROWSKI Piotr, MATHEWSON Kory, *Improbatics: Exploring the Imitation Game using Machine Intelligence in Improvised Theatre*, 2018
- MAGERKO, B., et al. *Employing fuzzy concept for digital improvisational theatre*. In AAAI AIIDE, 53–60, 2011
- MOHOV Sergey, *Turning a chatbot into a narrative game : language interaction in Event[0]*, nucl.ai conference, 2015
- PARDES Arielle, *What My Personal Chat Bot Is Teaching Me About AI's Future*, Wired, (2017-11-12). Retrieved 2018-04-24.
- PERLIN, K., and GOLDBERG, A. *Improv: A system for scripting interactive actors in virtual worlds*. In Proc Conf on Comp. Graphics & Int. Tech., 205–216. ACM, 1996
- RIEDL M. O., STERN, A. *Believable agents and intelligent story adaptation for interactive storytelling*. In Intl Conf on Tech for Int Dig St and Ent, 1–12. Springer, 2006
- SI, M., et al. *Thespian: An architecture for interactive pedagogical drama*. In Artificial Intelligence in Education, volume 125, 595–602, 2005
- TURING, Alan. M. *Computing machinery and intelligence*, Mind 59(236):433–460, 1950
- VINYALS Oriol, V. LE Quoc, *A neural conversational model*, 2015
- WALLACE, R. The elements of AIML style. ALICE AI Foundation, 2003.
- WALLACE R., TOMABECHI H., AIMLESS D. *Chatterbots Go Native: Considerations for an ecosystem fostering the development of artificial life forms in a human world*, 2003
- WEIZENBAUM Joseph, *ELIZA - a computer program for the study of natural language communication between man and machine*, 1966
- ZHANG, L., et al. *Affect detection and an automated improvisational ai actor in e-drama*. In Artificial Intelligence for Human Computing. Springer. 339–358, 2007

Theatre

- HIRATA Oriza, BAUCHARD Franck, BOUDIER Marion, *Le théâtre et les robots*, Agôn [En ligne], Points de vue, Entretiens, mis en ligne le 06 mai 2010, consulté le 02 juillet 2019. URL : <http://journals.openedition.org/agon/1170>
- KNEBEL Maria, *L'analyse-action*, trad. N. Struve et S. Poliakov, Paris, Actes Sud-Papier, 2006
- LEPAGE Louise, ADISESHIAH Sian, *Thinking Something Makes It So: Performing Robots, The Workings of Mimesis, and the Importance of Character in Twenty-First Century Drama: What Happens Now*, eds. (Palgrave, 2016
- VASSILIEV Anatoli, *Sept ou huit leçons de théâtre*, trad. M. Néron, Paris, P.O.L., 2007

Shows, performances, games

- A piece of work*, conception Annie Dorsen, production Armature Project, première le 21.02.2013 à On the Boards

(Seattle)

Hello Hi There, conception Annie Dorsen, production: Steirischer Herst, Hebbel am Ufer, BIT Teaergarasjen, Black Box theater, PS122, première le 24.09.2010 au Steirischer Herst (Graz)

Her, réalisation : Spike Jonze, production : Annapurna Picture, sortie en 2013

Lifeline, écriture 3 minute games, production : 3 minute games, 2015

SIRI, mise en scène Maxime Carbonneau, production: la Messe Basse, première au théâtre Prospero (festival TransAmérique) en 2016

To be or not to be, écriture Ryan North, production : Gamebook adventure engine, 2014

Tragedia Endogonia, mise en scène Roméo Castellucci, production : Societas Rafaelo Sanzio, Festival d'Avignon, première le 25 janvier 2002