# What Happens Next?: Toward an Empirical Investigation of Improvisational Theatre

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**Abstract.** We are engaging in the experimental study of improvisational actors in order to fully comprehend and computationally model what actors do during improvisational performances. Our goal is to fill in the gaps of our understanding of creativity and improvisation and to begin to integrate engineering methods with the theory and practice of acting. This paper presents the current methodological issues of a new experimental study of cognition in improvisational acting.

**Keywords:** improvisation, theatre, cognitive modeling, methodology, creativity

## Introduction

Improvisation in a theatrical performance can occur on many levels depending on the genre and style of performance, from the displaying of emotion, gesture, and posture, to the real-time determination of dialogue and narrative progression. There is a spectrum of improvisation in theatrical acting, from completely predetermined to completely non-predetermined [1]. On one side of the spectrum is the extreme case in which the performance of actors is completely scripted – displays of emotion, gesture, posture, positioning, dialogue, and verbal inflection and tone are all predetermined such that there is no tolerance for variation or individual interpretation. A more common model of theatrical performance is one in which dialogue and some instructions to actors are scripted, but the actors are responsible for interpretation and execution of the details of the performance. Differing styles of performance and interpretation of scripts involve differing degrees of improvisation skill.

Towards the opposite end of the spectrum one will find the genre of theatre called *improv* [2; 3]. Improv is a remarkable example of creative group performance because (a) the creation process of narrative content is completely in real-time, (b) there is no explicit coordination between the actors, and (c) in the case of unscripted improv, the constraints on a performance are typically of the form of a set of game rules plus audience suggestions. At the extreme other end of the spectrum is a form of improvisational performance in which there are no constraints on the activities of the actors given a priori, and everything is fabricated in situ.

There are schools of improv that have resulted in seminal publications and teaching methods (e.g. Johnstone's [2] teachings on "status transactions" and storytelling in improvisation or Spolin's [3] theatre games, such as the game "What Happens Next?"). These schools have elicited specific domain knowledge that expert improvisers are well versed in (e.g. strategies like "always accepting what is offered to you" or easy methods of establishing character, like Johnstone's "Fast Food Laban" and "Fast Food Stanislavski"). There have been attempts to codify some of this knowledge in the form of computational systems (e.g. [4]). However, the representation of these teachings can only bring us so far in our understanding of creativity. Comprehending how improvisation is taught (which has not been fully represented in a computational system to date anyhow) does not further our understanding of what actors *actually do* when improvising. To reach that level of knowledge, we need engage in the experimental study of actors performing improvisational acts. This approach has the potential to elicit deeper knowledge about what cognitive processes are being engaged during an improvised creative act (as opposed to representing concepts taught in seminal pedagogical texts).

Our goal is to fill in the gaps of our understanding of creativity and improvisation and also begin to integrate engineering scientific methods with the theory and practice of acting. Our key objectives are:

- The development of appropriate methodologies for collaborating with actors in order to capture data relevant to cognitive modeling. Our current work has focused on methodologies from (a) observational study [5] to (b) verbal protocols to (c) retrospective interview.
- The identification of (a) cognitive processes underlying improvisation, and (b) declarative and procedural knowledge employed in improvisation through a variety of experiments involving human actors.
- The development of implementable human behavior models based on our findings that contribute to research on autonomous agents and virtual humans that are capable of demonstrating creativity in the context of improvisational acting with or without human interactors.

The results of this work will be directly applicable to the development of autonomous agent and virtual human technologies that can improvise performances or act in the presence of human interactors. One of the intended outcomes of this ongoing work is the advancement of the design of autonomous agents for entertainment, distributed education, and training that are capable of reasoning about themselves, other autonomous agents, and human interactors to perform believably and effectively in uncertain environments where real-time behavior is essential. This paper presents the current methodological issues of a recently begun experimental study of cognition in improvisational acting and the application of the resulting theory to the behaviors of synthetic characters.

## Improvisation

Theatre has been suggested as a model for believable agents [4; 6; 7]. A believable agent is an autonomous agent capable of expressing emotions, personality, and other visual and behavioral qualities that facilitate the willing suspension of disbelief. However, little has been done to investigate the creative processes that underlie improvisation in theatre. To increase our understanding of creativity in the context of improvisation in theatre, and our understanding of improvisation and creativity in general, our research investigates (a) new methodologies for studying improvisation (b) new computational models of creativity, emotion, and improvisation in the context of theatrical acting, and (c) how to apply these models to the performance of believable characters.

Improvisation in the arts (i.e. theatre, dance, and music performance) can be differentiated from other domains in which improvised problem solving occurs because actors select actions for creative purposes rather than solely ones of correctness or efficiency (e.g. improvisation is a means for handling unexpected failures in domains such as organizational management and emergency response). We view improvisation as a group activity that involves communication between the performers as well as an array of cognitive processes to formulate and select actions quickly.

The current body of research on improvisation, which most notably comes from the improvisational music domain, points to the following generalities:

Improvisation is a constant process of receiving new inputs and producing new outputs [8; 9]. Improvisational dance, theatre, music, etc. all depend on performers observing their own and other performers' actions, performing some quick deliberative process, and then selecting new actions to perform. An improvisation model must be able to process and interpret these inputs as knowledge involved in decision-making.

Improvisation is a "continuous and serial process" [10] as opposed to one that is "discontinuous and involving iteration," such as music composition [11]. This suggests that there are specific cognitive processes that are employed during improvisation that are either a) different from those used during non-improvisational acts or b) are used with different constraints than those used during non-improvisational acts.

Improvisation involves decision-making based on domain-specific as well as real-world knowledge [9; 12; 13]. A key aspect of this knowledge is the use of a "referent" as background knowledge for improvisation [8; 10; 11]. A referent eases cognitive load during improvisation by providing material for variation, allows for a palette of pre-performance structures to be created by the performer, and reduces the need for complex communication cues with other performers. Therefore, a model of improvisation should be capable of processing and applying these kinds of semantic structures for both inspiration and the lessening of cognitive load.

Collaborative improvised pieces (as opposed to solo works) may involve both explicit and implicit communication [9; 14]. Body language, domain-specific cues, and verbal commands all contribute to the collaborative process of performing a group act. Any model of improvisation needs to address how communication to others in the group is used for coordination.

Improvisation is a process of severely constrained human information processing and action [8; 12; 15]. As Pressing [8] points out, an improviser must, in real-time, optimally allocate attention, interpret events, make decisions about current and future actions, predict the actions of others, store and recall memory elements, correct errors, control physical movements, and integrate these processes seamlessly into a performance. How this view of cognitive constraints maps on to the theatre improv domain has yet to be shown.

## Toward a Methodology for Studying Improv Actors

As described earlier, we are designing experiments with improvisational actors to elicit data on the cognitive processes and knowledge structures that they employ in order to build computational models of improvisational behavior. Examples of the hypothesized knowledge used include cultural knowledge, dramatic principles, practical experience, heuristics for selecting actions based on previous events, and meta-cognitive processes such as self-monitoring to stay "in character" and intentions of collaborators. Our current task is to design and execute an experimental design. Unfortunately, studying improvisers is an inherently difficult task. Direct observation of improvisational acting, such as MRI studies or traditional think aloud protocols, are impractical; performers cannot group together in an MRI machine nor can they think aloud while they are performing typical improvisation games. This forces us to consider novel methods for studying performance that allow us to get as much useful data as possible while at the same time having little to no effect on the participants as they perform.

Our first problem to solve is: *how do we collect data?* There are previous observational methods from social psychology and ethnography that can be adopted. Our design consists of observing actors as they improvise and coding the observed behaviors [1]. Our initial coding dimensions are:

- Referent codes (e.g. using game rules)
- Standard improv techniques (e.g. rules from Johnstone [2] or Spolin [3])
- Coordination (e.g. dictating other actor's character, establishing platform, (i.e. the setting, characters, and relationships in the scene))
- Workload (e.g. how long it takes to enter a scene, how long it takes to respond to a question or command, errors that occur, storing & recalling memory, etc.)
- Action selection / generation (e.g. heuristics for selection, generation of actions to consider, execution of selected action)
- Intention (actor's intentions and their model of the other actor's intentions)
- Error correction (e.g. recovery from misunderstanding a coordination attempt)

We will apply codes to videotaped improvised performances within an experimental setting based on both experimenter observation and retrospective protocol collection. The observational data will rely on our understanding of cognitive psychology and improvisational acting to create an appropriate coding scheme, as suggested by the dimensions proposed above. The retrospective protocols will involve showing performers a videotape of a performance that they have just created and continuously guiding them to comment on what they were trying to do.

Our second problem is: *what data do we collect?* Our current design is geared towards presenting players with modifications of typical improv games that are designed to elicit data of a specific nature. We are exploring methods for both *within-game* modifications as well as *meta-game* modifications.

Within-game modifications can be viewed as different dimensions that define a game that can be mapped to the different coding dimensions described above. These modifications change how the actor(s) improvise a scene, very similar to how improv game rules dictate how the scene is played (e.g. "you are only allowed to speak in questions"). Current within-game dimensions include:

- Amount & kind of game constraints: How specific are the game rules? How much of the platform is given? How much of the narrative is dictated?
- Response time: How much time is given to respond to their other actors? What amount of preprocessing time is given before a game begins?
- Privilege: Who is given what constraints? (e.g., one actor could be given an entire platform in secret while another is given none).
- Number of actors on stage
- Length of scene
- Narrative control: Who is told to lead the scene, if anyone?

Meta-game modifications deal with how each game is run by the experimenter. For example, we will run the same scene multiple times with different actors. This will give us a rich data set across individual and group dynamic differences. We will disrupt scenes to effectively ask, "what are you thinking?" to get one-time direct observations of actor cognition. This is not so different from certain improv game rules (e.g. the games "What Happens Next?" or "Freeze").

The specific choice of games will also be a meta-level issue in experimentation. Given to the large amount of data these experiments will produce, we are aiming for shorter scenes when possible and simpler games using dyads or triads of actors instead of entire troupes. Further we are considering reducing complexity by limiting the communication modalities that actors have available to spoken word. If we can see evidence of decision-making, collaboration, workload issues, etc. in these sparse performances, then we will have a strong story to tell about fundamental cognitive issues in improvisational theatre performance.

## Toward Computational Modeling of Improv Actors

Once we have constructed a theory of cognition in improv from our data, we need to build a computational model based on it for evaluation. The next stage, therefore, is to implement the built theory in a computational architecture. We will implement the codified theory as declarative and procedural knowledge in a Soar agent [16]. The purpose of this is threefold. First, since the Soar architecture is a well-established, independently researched theory of human cognition, the extent to which our informal model maps into Soar formalisms tests whether we have considered the requisite aspects of cognition to build a human behavioral model. The Soar architecture provides many of the cognitively motivated mechanisms (e.g. declarative and procedural memory, heuristic selection of actions, etc.) that allow us to build on a pre-existing unified theory of cognition, rather than creating a model from scratch. Second, this enables our investigation to contribute to research on intelligent agents because the formalization of our initial model of improvisational acting doubles as a potential approach to the design of autonomous agents that are situated in uncertain, unpredictable, real-time environments. Third, Soar has been effectively used to build large-scale interactive agents [17; 18]. Part of this implementation will include a meta-analysis of the suitability of Soar, which will hopefully identify future architectural needs as well.

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