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# The Wizard without Shadow

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## ABSTRACT

The paper describes *The Wizard without Shadow* [6], an artwork proposal for Artech21 conference. The 16 minutes performance involves an actor and an operator in an easily deployable setup. After a description of its artistic and technical context and motivations, the five realization steps are detailed. The performance involves motion capture animations and achieves interactive dialogs with 8 avatars in a virtual shadow theater.

## CCS CONCEPTS

• **Human-centered-computing**; • **Interaction design**; • **Empirical studies in interaction design**; • **Applied computing**; • **Arts and humanities**; • **performing arts**; • **Computing methodologies**; • **Computer graphics**; • **Animation**; • **Motion capture**;

## KEYWORDS

Avatar direction, mixed reality, motion capture, performing arts

### ACM Reference Format:

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## 1 TECHNICAL AND ARTISTIC CONCEPTS

### 1.1 Shadow avatars talking to children

The entry point of the creation-as-research *The Wizard without Shadow* is a decision to create a performance in the aesthetic of CAVOAV, a CAstelet in Virtual reality for shadOw Avatar [2]. This concept associates a 3D set design inspired by traditional shadow theater, and virtual flat silhouette actors, called shadow avatars. It fosters the circulation between different states of realities, featuring physical actors interacting with 2D/3D shadow avatars in a mixed reality stage. It was previously explored with the performance *The Shadow* based on the homonym fairy tale of Christian Andersen [1]. There was one physical actor playing with 5 avatars. He was sitting in the left corner of the stage behind a table next to the screen, driving the evolution of the shadow avatars with his voice modulated in a real time musical environment. His body acting was minimalistic.

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*The Wizard of Shadow* aims to explore another aspect of the aesthetic, deepening the gesture interactions between the physical actor and the virtual characters in different situations: face-to-face dialog between the actor and only one avatar and group scenes with multiple avatars. Consequently, the actor is placed in front of the screen in order to underline his physical presence for the audience and his virtual partners. In that way he gets a liberty of movements and actively reacts to the actions of the shadow avatars and keeps an eye contact with the audience.

The performance should fulfill three conditions: the plot might be related to the shadow theme, it should be a story for children, it has to give plenty of playful situations. The Scottish fairy tale *The Black Airts* matched these conditions. It talks about a boy Jaimie who is going to a school of magic. In the end of courses, a pupil must stay forever with the school master as his slave. Jaimie proposes his shadow instead and saves everyone as the master accepts the trick. Jaimie gets the nickname “The Man without Shadow”. Collecting variations of this story in different folklores, the director wrote her own adaptation as the original play.

### 1.2 AvatarStaging framework

Avatar animation in the performance is based on AvatarStaging, a low-cost framework dedicated to theatrical experimentations with digital characters and physical performers in mixed-reality setup (cf. fig. 2) [4]. An actor equipped with a costume of motion capture (a mocap) plays in a space encircled with screens that show the virtual world. The mocap properly sees the result of his acting, adapts his movements for the specificity of the digital scene and interacts with a physical actor and other virtual characters.

AvatarStaging offers a possibility to simulate live interaction between the physical actor and avatars pre-recorded animations [3]. The feature is based on a system of idle and salient actions, that makes avatars alternate between active and passive actions, passing to the waiting idle mode once a salient movement is accomplished. It permits to adapt the speed of the digital performance to the speed and intensity of the physical acting, keeping a live interaction between physical and virtual stage partners, interaction which lies in the heart of the theater. This feature allows the performance to be easily transportable as it involves only two persons: the physical actor and an operator who launches avatars’ animations. On the other hand, it technically needs only a screen, a video-projector, a computer that sends the digital image and optionally a spotlight to put a visual accent on the physical actor.

During the show, the actor is on a stage extended by a virtual world and plays with pre-recorded digital puppets. The use of AvatarStaging posed two issues: creation of believable interactions between the digital characters animated by only one mocap and creation of a plausible illusion of active connection between the physical and the virtual worlds. As soon as the actor comes in front of the screen the audience automatically starts to compare

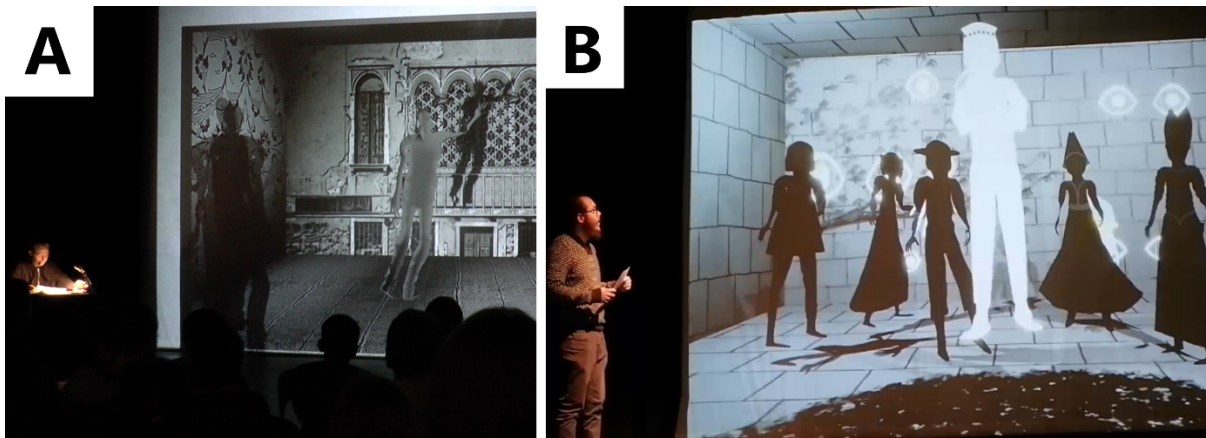


Figure 1: *The Shadow* (A) – *The Wizard without Shadow* (B)

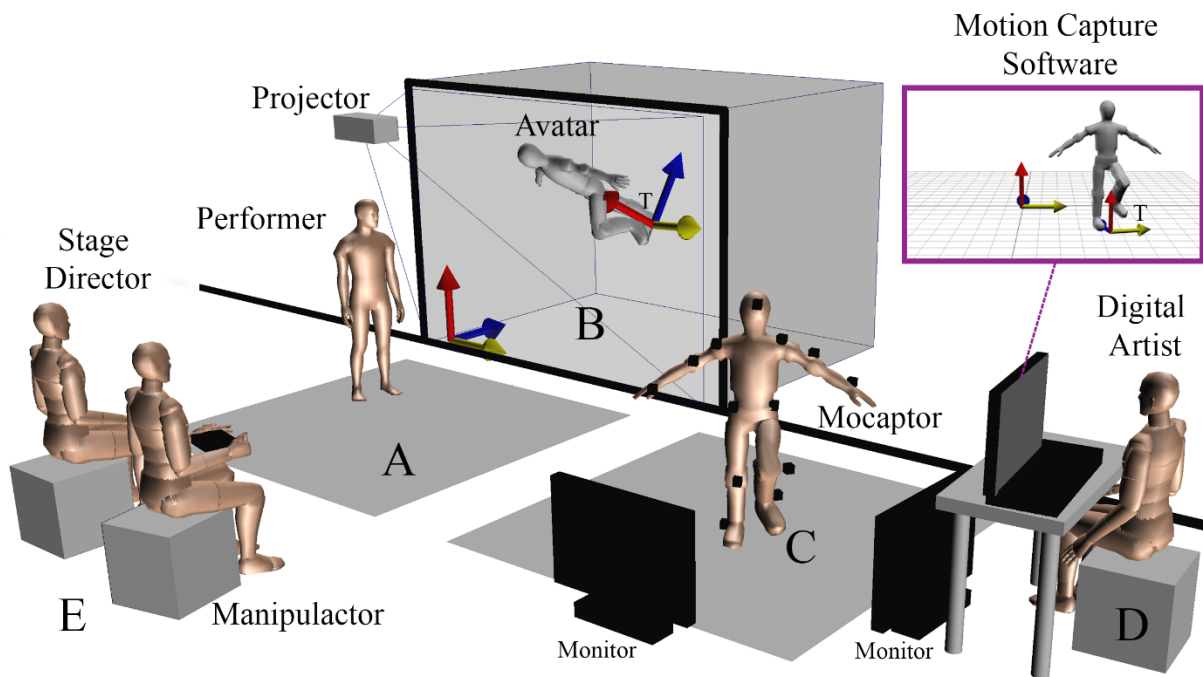


Figure 2: AvatarStaging setup

his reactivity with the reactivity of the avatars. Idle actions become more obvious and challenge the belief in the living presence of the avatars. The aim is to create a reactive performance, keeping all the possible liberty for the actor to keep the performance intense.

The creation-as-research took place between the end of February 2020 and mid-January 2021 with interruptions and lasted about 6 months in total. To achieve plausible interactions, the creative process articulates 5 phases detailed in the next sections: writing a storyboard, preparation of digital characters and spaces, recording of the actions, integration of the recorded actions into the digital performance, rehearsals with the actor in final conditions.

## 2 PREPARATION

### 2.1 Storyboard

The privilege of writing an original play already offers a number of possibilities to draft relationships between all the actors of the performance, but the storyboard helps to enter the details of interactions (see fig. 3). Writing a storyboard permitted to clearly articulate and define the number of avatars in each scene, the audience focus points, the transitions and virtual scenery of each scene and the animation recording strategy. Besides, it became a document of

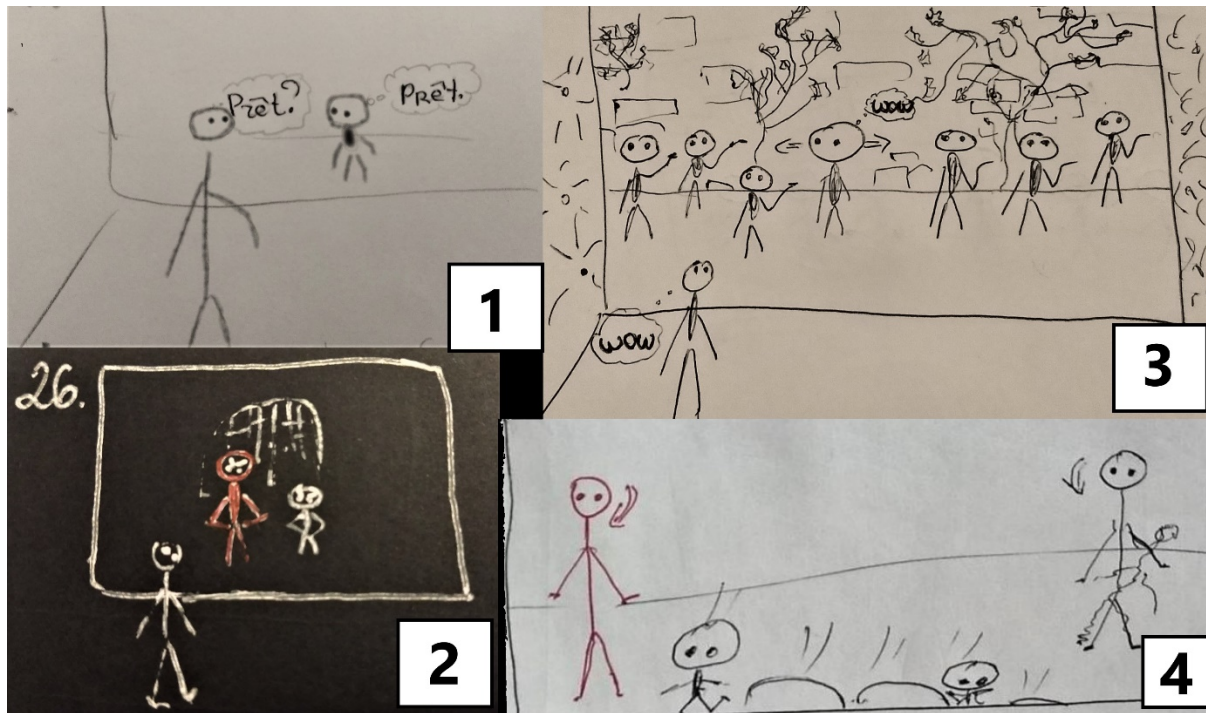


Figure 3: Four excerpts of the storyboard

communication between the director, 3D-artist, actor and mocaptor as well as the guideline for the rehearsals.

The action was split in 5 parts that happened in different spaces. The first one is a dialog between the actor and Jaimie's avatar. The actor enters the stage where he meets Jaimie playing with his shadow in a neutral space (fig. 3-1). The actor begins to tell the story while the space gradually fulfills with decorations of Jaimie's home. The second part happens in the dark. Jaimie arrives to the school and meets the schoolmaster (fig. 3-2). In the third part he studies magic with 6 other pupils in the school yard (fig. 3-3). The fourth part is the last day when the 7 children get out from the school (fig. 3-4). The last part in the darkness is the farewell between Jaimie and the actor.

An analysis of the storyboard shows that 3 types of focus point characterize the audience attention. The spectator has a focus on the dialog between the actor and the avatar and shares his attention equally between both partners (shared focus). Part 1 and 5 belongs to this type. In parts 4 and 5, the spectator focuses on 7 avatars practicing magic in the virtual world (avatar-oriented focus). The third type is an actor-oriented focus when the spectator looks at the physical actor, letting aside the action on the screen. The behavior of the audience is complex and circulates fluently along these 3 focus types. A hypothesis emerges that the animation strategy specifying the interactions between actor and avatars may influence the audience focus. As shown in fig. 3, these interactions are written on the storyboard by blockings and facial expressions, even for the shadow avatars, by nature deprived of face.

## 2.2 Creation of the avatars and digital spaces

The next phase is the creation of avatars and digital sceneries. Each of the 8 virtual characters has a different silhouette, inspired by Middle Ages style, according to the ancient origin of the Scottish tale (fig. 4). Afterwards each character got its proper name and the story of its origin, its motivations to learn magic, its dreams and relationships with other pupils. These details do not appear in the play, but they are important for the mocaptor who animates the avatars.

For the virtual scenography it was decided to choose the style of children drawings. All the scenography was drawn manually and afterwards transposed in the virtual world. An issue for the 3D-artist was to create appropriate conditions for the mocaptor. The digital space he inhabited with his avatar must match the measures of his physical space, in that way he could freely move on the physical stage easily covering the virtual one as well. To solve this matching issue between virtual and physical stages, the physical rehearsing space is measured, a plane of the matching size is placed in the 3D world and the sceneries dimensions are adapted to it.

## 3 ANIMATIONS RECORDING

To preserve the quality of avatar movement in the animations, the director chose to record long sequences of actions, that would be cut afterwards to produce the numerous salient and idle animation pieces necessary for programming with AvatarStaging [3].

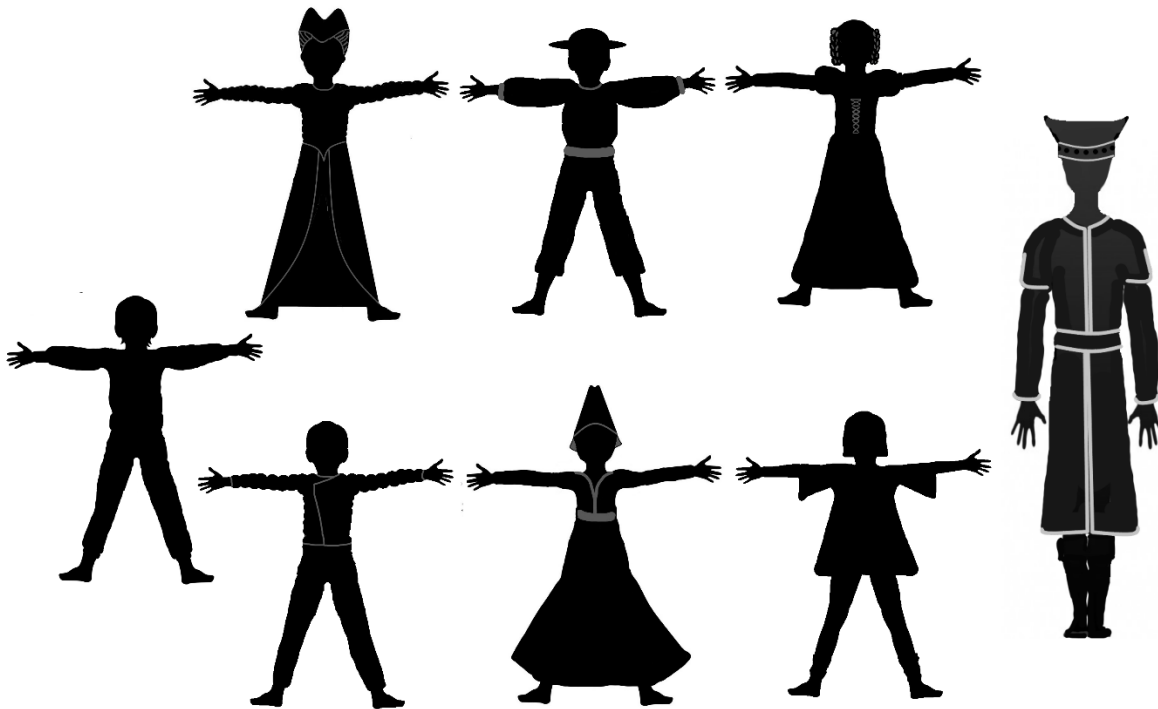


Figure 4: Shadow avatars in The Wizard without Shadow

### 3.1 Improvisation strategy

As the driving idea of the performance was the interactivity between the actor and the avatars, the director chose to record the movements working together with the mocaptor and the actor in a shared space equipped with numerous screens. Fig. 5 shows the rehearsal of the storyboard first part when the spectator gets acquainted with Jaimie.

First the actor reads the text while the mocaptor animates Jaimie and discovers the virtual space, keeping in mind the movements proposed in the storyboard, but still having a lot of liberty for improvisation. Afterwards the actor gives his lines to the avatar, that inspires the mocaptor for the interactions. The creative team noticed that avatar gestures were more expressive when the mocaptor replied vocally to the actor, although Jaimie was not supposed to speak. Once the improvisations finished, the team chooses the best moments and writes a movement score that the mocaptor learns attentively. The last step consists in recording the movement score, taking in account that salient actions must be a bit shorter than reading duration of the text respective part, and idles must be longer. Moreover, the mocaptor spatial dispositions must precisely follow the score as they are not adjustable once recorded.

The first part lasts 4 minutes and took 5 hours of rehearsing. Though time consuming, improvisation gives fruitful results, helping to create avatar vivid actions that respond to the text. The first version of the storyboard proposed 9 salient actions as the final movement score has 12 salient actions: the avatar actively inhabits the virtual stage, looks at the actor or reacts to his words. This method is satisfactory when the mocaptor controls only one avatar. It does not work in the scenes with group interactions as

the mocaptor must interact with other avatars that are not yet animated.

### 3.2 Golem-puppeteer strategy

With only one mocaptor, a solution is to record the group scenes character by character, progressively adding each one in the virtual scene. For the first character, the mocaptor has no virtual partners, though he must perform precise interactions. The director decided to guide him vocally telling him where to look and what to do.

For example, in the third part of the storyboard, Jaimie comes to the class, discovers the powers of his class-mates and learns magic. The first step was to make a revision of the storyboard, adapting and specifying the details of the actions. Secondly, Jaimie's blocking was recorded as the other characters focused their attention on him several times. The third step was the recording of the secondary characters one by one, the director pronounced out the actions and counted down the idles, that the mocaptor accomplished precisely. Finally, when all the secondary characters were integrated into the scene, the mocaptor recorded Jaimie's action properly, reacting to his virtual partners and still listening to director's indications.

According to [5], the avatar animated in real time or pre-recorded is a virtual puppet as the origin of the movements and decisions comes from an actor or a digital operator. In his definition the golem is another type of animation, where the origin of movements belongs to the golem, but the decision to move comes from outside. In this paradigm, the mocaptor finds himself in a situation when he is the puppeteer of the avatar and at the same time the golem of the director. As a golem, the mocaptor develops a movement autonomy by exploring the movement quality of the secondary characters as

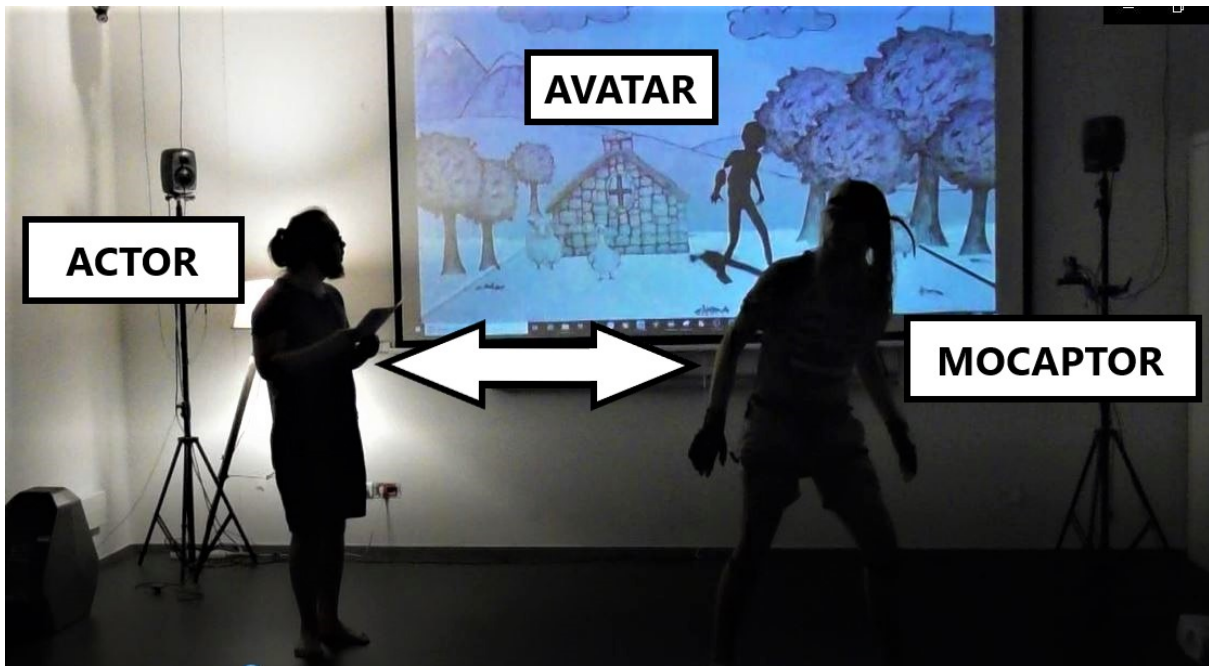


Figure 5: Actor and mocaptor rehearse the story beginning



Figure 6: Jaimie and his classmates learn magic

exposed in their subtext definitions (see 2.2). But he must follow director indications to be synchronized with the group actions. The liberty of improvising each character style is limited by director instructions to follow the storyboard. However, this approach is efficient as it permits to rapidly record different characters with only one mocaptor.

## 4 FINALIZATION

### 4.1 Integration of pre-recorded movements

The integration of the pre-recorded movements in the virtual scene is a very technical part of the staging which demands a lot of patience, accuracy and attention. It starts with an organization of

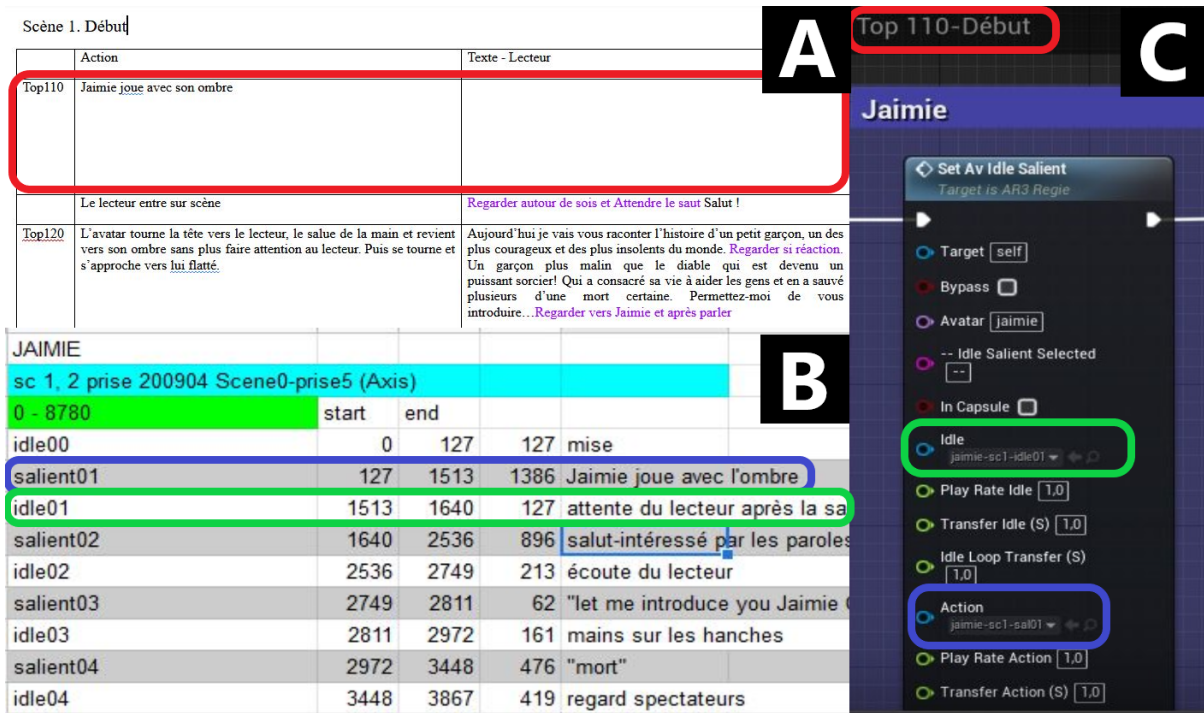


Figure 7: Organization of operator cues driving avatars

the text according to operator cues that trigger salient actions (fig. 7A). Afterwards each recorded animation is described in a table with a title, start/end action frames and a short description (fig. 7B). The third step consists in cutting the long sequence in shorter animations following table indications. The short descriptions are helpful in the fourth step, while programming the cues. Each cue contains the orders, addressed to avatars to accomplish a chosen salient action and to pass to a chosen idle action (fig. 7C). Fifth and last step is checking and adjustments of the programming.

The operator finally triggers 70 cues during the 16 minutes performance duration, that makes a new salient action every 14 seconds. This result corresponds to the initial intention to create an active gesture interaction.

#### 4.2 Final rehearsals with the actor

The last realization step consists in directing the actor and the operator to play with the avatars animations. The actor must carefully observe all the nuances of the virtual performance and underline its salient parts. The main issue is to organize the audience focus point as written in the storyboard (see 2.1).

In the story first part, the actor reminded the improvisation rehearsal context and shared his own attention to dialog with Jaimie and to tell the story to the audience. The spectator might adopt a shared focus viewpoint on the actor and the avatar. Physical acting is precisely completed by the operator who triggers Jaimie's salient animations.

For the story third part, avatars' animations were entangled following the golem-puppeteer strategy and did not contain improvised interactions with the actor. As an expected result, the

spectator might adopt an avatar-oriented focus that asks the actor to become a simple observer of the screen. Technically the actor turns to the screen and put all his intentions in the observing of the virtual performance, comforting the audience in doing the same.

## 5 CONCLUSION

The performance was successfully created the 21st of January, 2021 in Jean Macé school of Villiers-Le-Bel in front of an audience of 25 children (10 years degree). The interactions between actor and avatars are generally appreciated. From the creative team viewpoint, explorations in the animation recording strategies could be done to help the actor organize his attention between the digital stage and the audience. The spectators would navigate more fluently between shared, avatar-oriented or actor-oriented focus.

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