WATCH MY MOVES: FROM DIGITAL PLAYS TO THE DIGITAL PLAYBOOK

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ABSTRACT
The goal of this project was to redesign an experimental prototype and apply its design features to a different and only tangentially related model. In testing the transferability of a very specific technology across domains we hoped to illustrate how the redeployment of digital design can create affordances for the designer and user alike. The original prototype is an online system for playing back the text of a script [1] intended to support directors in blocking plays, actors in learning their lines, and students in studying plays [2]. This system, "Watching the Script," provides an important educational mid-point between the static printed page and the staged or cinematic play. From this initial prototype, we repurposed the design for use by sports teams, and in particular, American football teams. The new design is intended to support coaches in designing plays, football players in learning them, and fans in watching stylized re-enactments of games. Although a number of software packages provide these groups with the opportunity to play virtual games or view existing plays, our prototype extends functionality in several uncharted directions. Much as a student of drama might replay an entire script, our "Digital Playbook" provides the ability to replay an entire football game from kick-off to touch-down. The "Digital Playbook" can also review sports plays in multiple ways: following a single player, selecting parts of the field, or viewing only offense or only defense. This mirrors its previous use in "Watching the Script," where actors could isolate their part to learn their lines, or directors could replay all the action in a given location. By identifying, and exploring parallel design functions across domains, the evolution of "Watching the Script" to "The Digital Playbook" illustrates how the considerable time, effort, and money spent creating a prototype can, with some thought to the essential needs of the wildly

different fields, be recouped through its repurposing. Moreover, by playing with some of the elements of functionality demanded by the original, the designer and user can discover some delightful new ways of looking at their own project, which an independent design might not have offered. We ourselves found that football is a kind of theatre, the text is the play, and 'the play is the thing.'

KEYWORDS
Computer-Human Interaction, Visualization, Football, Interface Design, Repurposing Technology, Cross-domain Affordances

INTRODUCTION
This project examines the redeployment of an existing online prototype for a new purpose in a different field. The goals of the project therefore include increasing our understanding of online tools for two different domains and discovering insights derived from the attempt to take a set of digital affordances created for one area of application and repurposing them for a radically different set of activities and users.

We began this investigation with an experimental system designed to support actors, directors, and theatre students. It incorporated a number of functions specifically intended to assist each of these user groups, while at the same time taking advantage of affordances, the ability of digital text to provide new opportunities for action, that are not otherwise easy to obtain. For example, the prototype for "Watching the Script" allows the viewer to see the same script at three different levels: a microtext panel for overview of the entire play, a reading view for selected portions, and a stylized stage that shows character movement and scrolls the text past each character at a comfortable reading speed (Figure 1).
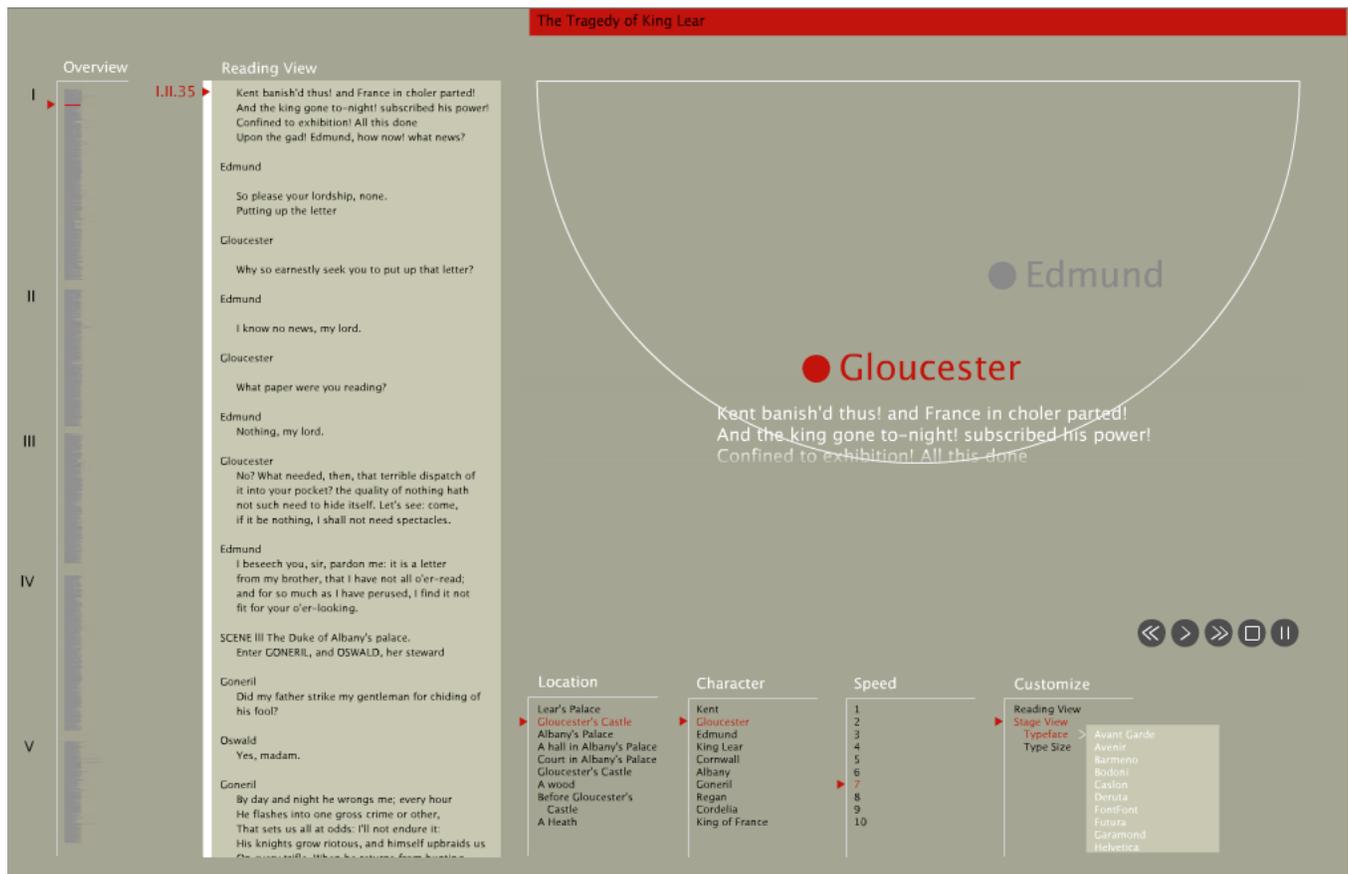

Figure 1. The online prototype for "Watching the Script" allows users to load any XML-encoded play, add blocking information, and watch the results play back on a virtual stage.

Following an intriguing suggestion by our colleagues (Philip Grew and Marion Ben-Davis), we determined to find out to what extent our prototype could lend itself to redesign for use as a way of supporting people interested, not in watching a stylized version of digital plays, but rather a stylized version of football. We determined that

in transferring the technology from the theater to the field we could push the envelope of repurposing digital technology across domains, and in doing so, create an educational tool for the football users comparable to the value of "Watching the Script" for directors, actors, and theatre students.

Our first observation is that *the text* is a central part of "Watching the Script." In fact, during the course of our iterative design process for the prototype, attempts at realism introduced unnecessary visual elements to an already sufficiently complex environment, detracting from the value of the text playback. For a football system, however, *text* is more or less irrelevant. However, we observed that the concept of the prospect view on the extreme left of the screen, which allows the reader to get an overview of the structure of the entire play, remained a crucial element for preservation and expansion. In this case, we would provide an overview of the structure of the entire football game.

We then moved to a more focused view of the domain transfer. The script for a play contains structural divisions in the form of acts and scenes; even when these haven't been provided by the author, there is the opportunity to add a "French scene breakdown," where a new scene is indicated whenever someone enters or leaves the stage. Thus, our second observation was that whereas theatre allows for both structured and interpretive breaks, we were able to easily translate the individual plays in each quarter of a football game to the structural divisions designed for the different scenes.

PREVIOUS LITERATURE
The background of our original prototype for watching scripts includes Bork's [3] taxonomy of methods for displaying text on screen, Small's [4] prototype system for navigating the plays of Shakespeare in three dimensions, and our own strategy of providing a combined set of simultaneous views of text at different scales [5]. Each of these examples emphasizes the importance of treating digital text as an opportunity for providing new opportunities for action (that is, new affordances) to the user.

The idea of extending the affordances available to users of digital text derives in part from the work of ecological psychologist James Gibson [6], who posited that people are able to directly perceive the opportunities for action in their environment [7]. The design of new affordances in the digital realm leads in any number of directions, including the possibility we discuss here of taking tools intended for one purpose and modifying them for use in a completely different arena.

Finding alternative forms for sports broadcast has been a subject of research activity in computing science and related disciplines for more than twenty years. Previous work in this area include attempts to automatically extract important features of games, for purposes such as annotation [8] and linking live footage with replays that may have been captured at other angles [9]. Researchers have also looked at a range of related topics, including football animations for display on mobile phones [10] or comparisons of architectures for online football games [11].

There are a number of excellent resources available in the area of electronic collections of football plays. These include the turbostats system [12], which allows users to view, create, and store plays for playback, and which stores a wide range of statistics about the players and the game. An alternative system is football-plays.com which provides coaches with a wide range of plays for offense, defense, and special teams [13].

DESCRIPTION OF "THE DIGITAL PLAYBOOK"
The goal of our revised prototype is to provide an educational environment for players, coaches, and fans to view and review stylized representations of actual games. Viewing digital simulations will enable them to learn more about the reasons for the success and failure of the various plays executed (Figure 2). Furthermore, animated visualization, which will create an alternative learning environment for these users, will also provide them a new, innovative, and enjoyable format for watching the game from a whole new angle.
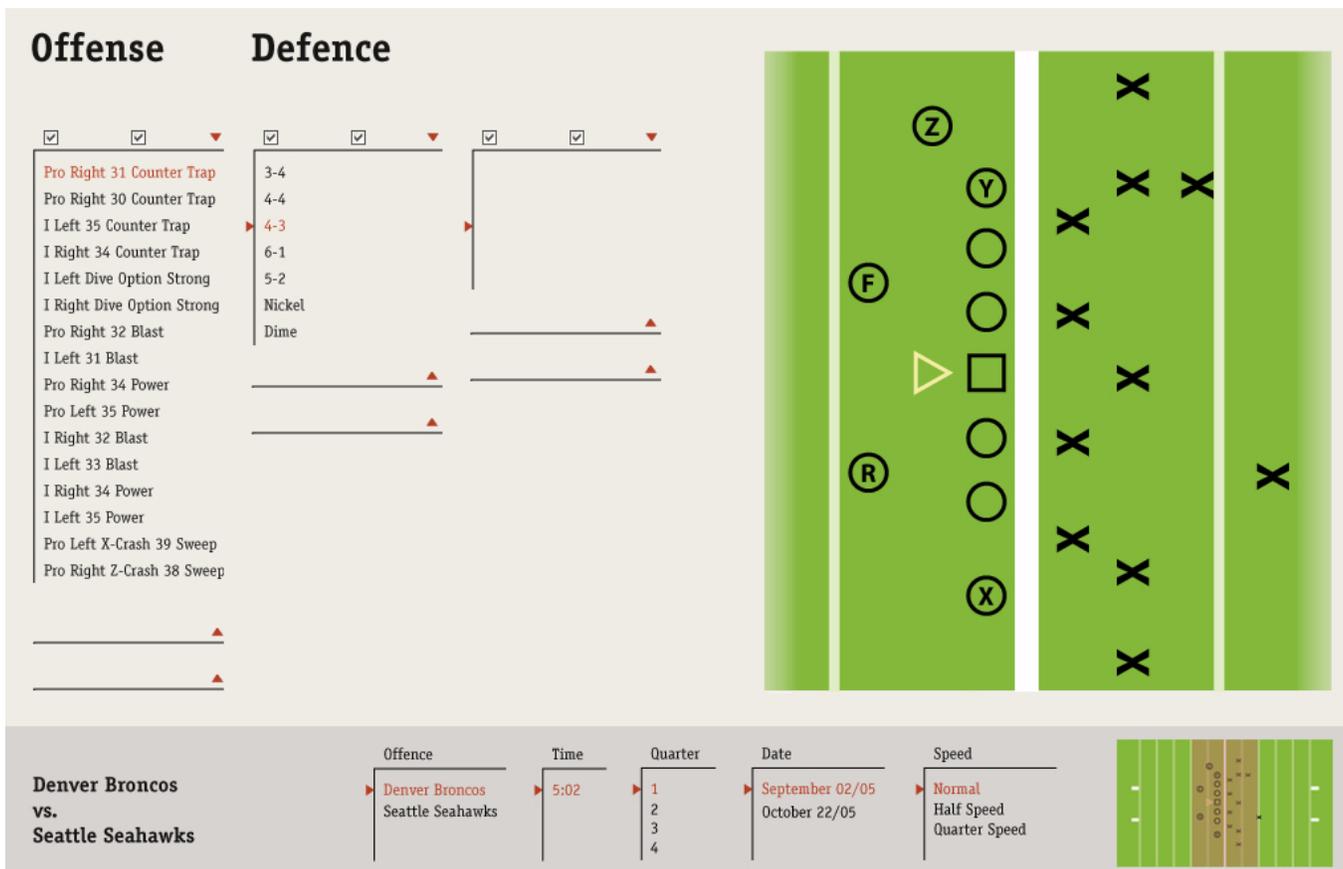
Figure 2. The initial sketch of the "Digital Playbook" shows the redesign, which incorporates many features similar to those found in the earlier prototype, including movement on the stylized field, and the ability to replay either the entire game or selected portions. Text, however, although it is central to the "Watching the Script," has little place in this version.

Initially, the user chooses an existing game from those available, which loads both the offensive and defensive plays. The system runs the stylized game in its entirety, as it was played. At any time a user can pause a game, run the game at full speed, half speed, quarter speed, or change the game clock time to fast forward to a particular play or event.

The user can select and watch specific portions of games; for instance, one can call up all the instances of a particular play, and watch when and how many times it occurred in a game. Alternatively, it is possible to select a particular player, and selectively view all the plays she or he was involved in or all the offensive plays by one team. Finally, the user also has the option to select a part of the field, for example the 10 yard line, to view everything that happened there.

In terms of layout, there are two views – a close-up or 'play view' and a wider 'field view'. The play view gives the user a 20 yard top view of the field, while the field view allows the user to scan the entire field. This field view, in addition to providing a sense of prospect on the

entire field, would also help the user when the play encompasses more than 20 yards.

SCENARIOS OF USE
We envision three kinds of users for this system: coaches, players, and fans. Each of these cohorts has the opportunity to use the system as a study tool as well as a potential form of entertainment.

Scenario 1: Players
For players, the purpose of the system is to provide a learning tool for reviewing new or existing plays. By highlighting his or her position on the team, the player is able to watch in a simple, stylized format, the motion necessary to carry out a particular play. By comparing the use of that play by different teams under a variety of circumstances, the player can get insight into its historical levels of success.

Finally, "The Digital Playbook" is a tool for self-improvement for players interested in studying their own past performance or the performance of a particular opposing player. By selectively viewing only those plays involving themselves or their opponents, it may be

possible to see how their performance worked across multiple attempts at the same play during the same game, across multiple plays in the same game, or even across multiple games.

Scenario 2: Coaches
We foresee coaches being able to use the system in to replay, review, or block football games. First off, coaches would replay the games of their immediate competitors, in order to assess how the competition has behaved in the past. In another mode, the coaches might review a variety of games in order to study how particular plays have been used. In the third scenario, the coaches might be interested in seeing the performance of their own team played back in a stylized form, both for their own knowledge and alternatively for demonstrating selected portions of games for the team. Finally, by using "The Digital Playbook" blocking tool, the coaches can experiment with new kinds of plays or variations of existing plays that they are considering for inclusion in their own playbooks.

For coaches of smaller teams, schools teams, or community leagues, without the financial and educational resources afforded to larger leagues, the opportunity to engage with a visual system for studying, developing, and analyzing plays has the potential to make a critical improvement in constructing their playbooks.

Scenario 3: Fans
It is difficult to predict whether or not fans would be able to take advantage of "The Digital Playbook." By removing all of the realistic details of players and the field and the standard live or video-taped action, the "Playbook" may sterilize the experience of watching a game to the point that fans lose interest. However, for fans who are also keen in studying the game in detail, the "Playbook" may provide a unique opportunity to re-watch interesting portions of games and perhaps also compare them with other games where similar plays were used.

It may also turn out to be the case that the stylized format proves amenable for people who would not necessarily otherwise be interested in watching or studying football, opening up the possibility of new demographics becoming interested in the sport.

REDESIGN ISSUES
There are a number of features shared by a stage script and a football game. Both activities involve people moving within a constrained space and both are constrained by time. The two activities usually involve more than one person (although there are plays for just one actor). They also share the concept of roles, where a particular actor might appear in one part or several, and a given player might take one or more positions (although this is less common).

Plays and football games also differ, however, in almost as many features as they have in common. One of the principal differences is the importance of text for scripts, while text is virtually absent from football. Removing the centrality of text from the system implies a fairly significant difference: the original prototype includes text at three levels – an overview, a reading view, and a dynamic stage view. However, in the redesign, the overview is replaced by the lists of offensive, defensive, and special teams plays, and the dynamic stage view is replaced by two field views – an overview of the entire field and a closer view of the current action.

Another important difference is in the division of the players in a football game into two teams. Although exceptions can occur, as in the first Act of *Romeo and Juliet* when the Montagues fight the Capulets, in most plays the cast on stage at any given time will change as the play proceeds, but seldom does it divide neatly into two sides. For the redesign, this difference results in the need to distinguish between the two sides of the field, the players from each team, and the association of each section of the game with one side or the other. We chose to provide a single list of offensive plays to one side of the screen and a single list of defensive plays on the other, although the team associated with each kind of play will vary as the game progresses.

TECHNICAL ISSUES
One of the most basic issues to address is the availability of digital information in appropriate formats for display in this stylized manner. Whereas digital scripts for plays are widely available online, in many cases free of charge, the same is not true for football games. As a result, some of the technical issues for the redesign deal mainly with information and materials. Where does one find a full football game captured from a top view point? How can that be translated in such a way that all the players on the field can be marked, identified, and digitized? The simplest strategy would be to have one camera stationed above the field that recorded and digitized an entire game. The tops of the players' helmets make a convenient visual target for such a system, although player information would need to be separately associated with each helmet. A more complex, but ultimately more accurate method would make use of RFID chips embedded in the players' helmets in order to track their movement in three dimensions. Finally, manual entry of play data should also be supported, in order to recreate "classic" games.

Since our original prototype for "Watching the Script" is driven by XML-encoded text files, it will also be necessary to consider whether we would be better off to adopt a similar strategy for encoding the football sequences. Since XML and its related tools have been designed for use on the web, the system can run through any browser. XML also has the necessary flexibility, coupled with a large and ever growing installed user base. On the other hand, it may be more efficient to choose a

technology that is not predicated on the presence of textual data, but instead deals more directly with positional information and the data required to facilitate movement, such as Geographic Markup Language (GML). A hybrid of markup technologies will likely be required.

Due to the use of XML and other SGML-based markup languages, the play data can be represented using any number of programming languages, such as JAVA, XSLT, SVG, or Macromedia's ActionScript. This allows the same data source to be used in both online and offline contexts with no preconditioning.

CONCLUSION

Although this project is still in its early stages, "The Digital Playbook" promises to give us an illuminating window on the transfer of a specific technology from one subject domain to another. While stage plays and football plays share a number of features, they also differ in enough details that a redesign is more than just cosmetic. Starting from scratch, however, in the design of the football prototype tends to lead toward a particular set of design decisions that might be different from the direction implied by starting from a system focusing on scripts. By evolving the existing dynamic designs and transferring an online prototype from one domain to another, designers can both repurpose existing technologies in economically friendly and educationally useful way, and expand the parameters of design decisions beyond the scope of any predetermined field or stage.

FURTHER RESEARCH

As we complete the design work for "The Digital Playbook," the next phases will run in parallel. On the one hand, we have the opportunity to field test the concept with the three cohorts described in this paper—players, coaches, and fans—by getting early feedback based on the scenarios and sketches [14]. At the same time, we intend to develop a working online prototype, much as we've done for "Watching the Script," which will allow us to carry out more realistic usability studies among the three groups.

ACKNOWLEDGEMENTS

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