BattleSprout

Web-Anwendungsentwicklung Sommersemester 2023

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*Abstract*— Beschreibung der Software-Architektur für das Projekt BattleSprout von Team Rot. Dabei wird ¨ zunächst allgemein ein Überblick über das System gegeben, Architekturentscheidungen erklärt und auf Probleme bei der Realisierung eingegangen. Anschließend werden noch zukünftige Ausbaumöglichkeiten unserer Anwendung aufgelistet.

# Einleitung

## Mission Statement

Bei BattleSprout handelt es sich um eine Web-Anwendung, die es Spielern erlaubt, eine Variation des bekannten Brettspiels Battleships zu spielen.

Der Fokus liegt hier auf der Kombination von Wettbewerb und Kooperation. Es geht darum ein Strategiespiel zu erstellen, bei dem der Kern auf Zusammenarbeit liegt, jedoch trotzdem das Wettbewerbselement erhalten bleibt.

Dadurch soll beobachtet werden, ob sich die Spielermentalität ändert, wenn das Ziel ist, dem anderen Spieler zu helfen und nicht wie bei Battleships die gegnerische Flotte zerstören zu müssen.

Wir setzen dieses Projekt als Web-Anwendung um, da interessierte Spieler es dadurch einfacher haben, andere Menschen zu finden, die mit Ihnen spielen möchten.

## Spielregeln und Spielmechanik

Spieler müssen in BattleSprout strategisch vorgehen, um den Garten des Herausforderers zuerst erblühen zu lassen.

Vor dem Beginn des eigentlichen Spiels müssen die Spieler ihre Pflanzen auf einem Raster platzieren. Jeder Spieler besitzt ein eigenes Raster, auf dem er Pflanzen platzieren kann. Dazu kommen Wasserbomben, die abwechselnd von den Spielern auf die Pflanzen des Herausforderers geworfen werden müssen. Trifft man dabei eine Pflanze, so blüht diese auf. Der Spieler, der zuerst alle Pflanzen des anderen erblühen lässt, gewinnt das Spiel.

## Kontextabgrenzung

Die Darstellung zeigt das System als Blackbox und zeigt die Fremdkomponente auf und Interaktion mit dem BenutzerEin Bild, das Kreis, Screenshot, Diagramm, Astronomie enthält.

Automatisch generierte Beschreibung

## Architekturziele

Unser System soll folgende Architekturziele berücksichtigen:

* Zuverlässigkeit
  + Der Nutzer sollte eine Reibungslose Spielerfahrung haben
  + Die Verarbeitung der Spielaktionen und die Aktualisierung der Spielzustände müssen zuverlässig sein, um Spielausfälle zu vermeiden
* Benutzbarkeit
  + Die Anwendung soll für eine breite Gruppe von Nutzer intuitiv navigierbar sein
* Echtzeitkommunikation
  + Schnelle Aktualisierung des Spielstatus und Darstellung der Spieleaktionen

# Lösungsstrategie

## Systemüberblick

BattleSprout verwendet den MERN-Stack mit Typescript als Programmiersprache um die Vorteile der statischen Typisierung zu nutzen. Zusätzlich integrieren wir Socket.IO, um eine Echtzeitkommunikation zwischen Client und Server zu ermöglichen.

Ein Bild, das Text, Screenshot, Schrift, Grafikdesign enthält.

Automatisch generierte Beschreibung

## Architektur Frontend

Im Frontend verwenden wir React mit Programmiersprache Typescript. Durch die wiederverwendbaren Komponenten bei der Entwicklung mit React kann man verschieden Elemente wie das Spielbrett, die Freundesliste oder den Login eigenständig behandeln. Dies ist vorteilhaft bei der Entwicklung mit mehreren Personen, da man so recht unabhängig voneinander arbeiten kann.

Bei Spielen ist es wichtig, den derzeitigen Zustand eines Spiels im Auge zu behalten und bei Änderungen zu aktualisieren und die effiziente Zustandsverwaltung mit React funktioniert hier sehr gut.

Typescript ermöglicht es Funktionen und Schnittstellen klar zu definieren und somit mögliche Verwirrungen bei der Eingabe und Ausgabe der Typen frühzeitig zu verhindern.

## Architektur Backend

Für die Speicherung der Nutzer, der Rangliste und Freundesliste haben wir MongoDB gewählt. MongoDB erlaubt uns bei der Spieleentwicklung Datenstrukturen anzupassen und zu erweitern. Durch die sich ständig ändernden Anforderungen bei der Spieleentwicklung muss man Datenstrukturen im Laufe der Zeit verändern können und MongoDB erfüllt diese Voraussetzung souverän.

Express dient

## Kommunikation

Für die Echtzeitkommunikation benutzen wir Socket.IO, um die Verbindung während einer Spielrunde aufrecht zu erhalten und so eine angenehme Spielerfahrung zu gewährleisten. Außerhalb einer Partie verwenden wir eine RESTful API, um Navigation in der Anwendung übersichtlich und ausbaubar zu halten.

# Probleme bei der Entwicklung

Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections A-D below for more information on proofreading, spelling and grammar.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.

## Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

## Units

* Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as “3.5-inch disk drive”.
* Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
* Do not mix complete spellings and abbreviations of units: “Wb/m2” or “webers per square meter”, not “webers/m2”. Spell out units when they appear in text: “. . . a few henries”, not “. . . a few H”.

Identify applicable funding agency here. If none, delete this text box.

* Use a zero before decimal points: “0.25”, not “.25”. Use “cm3”, not “cc”. (*bullet list*)

## Equations

The equations are an exception to the prescribed specifications of this template. You will need to determine whether or not your equation should be typed using either the Times New Roman or the Symbol font (please no other font). To create multileveled equations, it may be necessary to treat the equation as a graphic and insert it into the text after your paper is styled.

Number equations consecutively. Equation numbers, within parentheses, are to position flush right, as in (1), using a right tab stop. To make your equations more compact, you may use the solidus ( / ), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

*a**b* 

Note that the equation is centered using a center tab stop. Be sure that the symbols in your equation have been defined before or immediately following the equation. Use “(1)”, not “Eq. (1)” or “equation (1)”, except at the beginning of a sentence: “Equation (1) is . . .”

## Some Common Mistakes

* The word “data” is plural, not singular.
* The subscript for the permeability of vacuum **0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
* In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
* A graph within a graph is an “inset”, not an “insert”. The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
* Do not use the word “essentially” to mean “approximately” or “effectively”.
* In your paper title, if the words “that uses” can accurately replace the word “using”, capitalize the “u”; if not, keep using lower-cased.
* Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
* Do not confuse “imply” and “infer”.
* The prefix “non” is not a word; it should be joined to the word it modifies, usually without a hyphen.
* There is no period after the “et” in the Latin abbreviation “et al.”.
* The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.

An excellent style manual for science writers is [7].

# Ausblick

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

## Authors and Affiliations

**The template is designed for, but not limited to, six authors.** A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

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#### Change number of columns: Select the Columns icon from the MS Word Standard toolbar and then select the correct number of columns from the selection palette.

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Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is “Heading 5”. Use “figure caption” for your Figure captions, and “table head” for your table title. Run-in heads, such as “Abstract”, will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced. Styles named “Heading 1”, “Heading 2”, “Heading 3”, and “Heading 4” are prescribed.

## Figures and Tables

#### Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 1”, even at the beginning of a sentence.

1. Table Type Styles

| Table Head | Table Column Head | | |
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1. Sample of a Table footnote. (*Table footnote*)
2. Example of a figure caption. (*figure caption*)

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

##### Acknowledgment *(Heading 5)*

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

##### References

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1. G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*
2. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
3. I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.
4. K. Elissa, “Title of paper if known,” unpublished.
5. R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.
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7. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

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