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Review of Gestalt Principles used in Computer Games: An evaluation of Graphical User Interface design

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Christy has spent the past 19 years as a graphic designer and illustrator. As a consultant she has engaged her passion for writing through design-focused research, both in her Master's degree in Communication Design (RMIT), and through developing course content for the AIE Institute's Bachelor of Game Development.

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Professor Manolya Kavakli

Prof Manolya Kavakli is an expert in Human Computer Interaction (HCI), Virtual and Augmented Reality and Computer Games. Her research involves the use of virtual reality and motion tracking technologies for the development of simulations targeting the improvement of human performance and expertise. Prof Kavakli is an architect who gained her B.Sc., M.Sc., and Ph.D. degrees in 1987, 1990 and 1995 respectively, from Istanbul Technical University. She was awarded a NATO Science Fellowship in 1996 for postdoctoral research and a Postdoctoral Fellowship from the University of Sydney, Australia in 1998. She worked as an Associate Professor at the Faculty of Architecture, Istanbul Technical University, and lectured in Computer Graphics and Game Design at the School of Information Technology, Charles Sturt University and the Department of Computing, Macquarie University.

She established the Virtual Reality Lab in 2005, where she was promoted to Associate Professorship in 2010. Prof Kavakli was the Director of the Virtual Reality Lab between 2005-2020 and the Director of Postgraduate Program between 2014-2018 at the Department of Computing, Macquarie University. She is currently the Academic Director of AIE Institute. She supervised 11 postdoctoral fellows and 133 postgraduate students (21 PhD, 4 MSc, 7 Honours, 34 MIT projects, 24 MIT Special Topics, 11 French MEng internships, and 32 MIT/MEng internships).

Prof Kavakli has been the recipient of 24 awards, including 6 fellowships and 10 Best paper and Education awards and nominations in the last decade. She received 34 research and infrastructure grants from a number of scientific international organisations and produced 227 peer reviewed publications including 20 book chapters, 55 journal articles, 130 conference papers. Prof Kavakli's research has been profiled in international media 45 times including ABC TV, ABC 7:30 Report, ABC and SBS Radio, and Sydney Morning Herald.

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I.
Introduction

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About our paper

Our paper explores the relationship between design for Graphical User Interface (GUI) of computer games, and the Gestalt Principles as used in visual communication.

- **Section II** we look further into the graphic design techniques used to apply Gestalt Principles. Grouping modes represent a strategy we use to incorporate the Gestalt into our designs.
- **Section III** we examine the use of these grouping modes in several contemporary computer games; the focus on GUI.
- **Section IV** addresses the analysis of underutilized elements of the Gestalt in contemporary computer game GUI and draws an evaluation with respect to the Gestalt Principles as used in GUI design, and lessons learnt from the analysis.

The acknowledgement and conclusions close the article.

Gestalt principles and graphic design

- Developed in the early twentieth century by German psychologists Wertheimer, Koffka and Kohler [4], the development of Gestalt principles began with a psychological study into vision; **what the eye or the gaze perceives and comprehends about what it sees** [1].
- The finding: that the brain's natural tendency is to group smaller elements into a larger, more complete picture (or whole), to: **"find and create order"** [2].
- We apply this principle as a tool of graphic design to:
  - direct the user or viewer to comprehend patterns of association in text and image.
- This leads to development of a logical and rational hierarchy of information, thus:
  - we hypothesize that Gestalt principles, when used as a strategy of graphic design in game GUI, will improve user engagement.

The Gestalt principles

The Gestalt principles in graphic design involve perceptions relating to space and form.

Visual relationships are based on the principles of:

1. **Proximity:** how space forms, or separates, groups
2. **Similarity:** similar elements will form a group
3. **Common fate:** change can occur as a group
4. **Figure/ground ambiguity:** negative or positive space can be used to manipulate the eye
5. **Closure or continuation:** of lines and structure – we close gaps in recognisable objects ourselves or are directed by repeated or continuous elements.

A Gestalt strategy

Gestalt visual comprehension strategies include:

1. **Reducing** elements to basic shapes.
2. **Using positive and negative space**, both foreground and background.
3. **Using pattern** (or disruption of pattern).
4. **Using 'the known'** to challenge the viewer to fill in missing information or identify shapes
5. **Utilising grouping modes**, which include simplicity, similarity, proximity, closure, continuity, and symmetry.

II.
Gestalt principles: What we know

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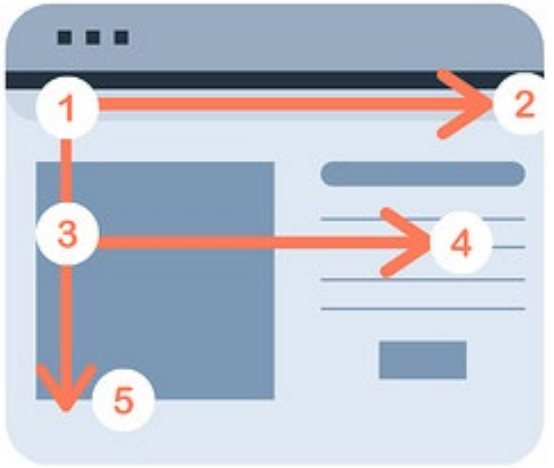
Ways of seeing

- By grouping related elements into wholes, we target simplicity.
- How we read a visual communication is complex and involves appraisal of the visual hierarchy (setting an order of importance).
- Viewing or reading patterns, such as in a ‘Z’ or ‘F’ pattern, help us develop appropriate graphic responses to placement of content (image, text), and narrative features [10].
- **We are looking for things which stand out to guide us visually: differentiation**.

Fig. 1 Patterns of viewing [10].



About computer game GUI

- GUI is the interactive element of computer games, or **“visual components that act as a means of communication between the user and various aspects of the game code”** [7].
- This includes elements of in-game interactivity, information displays, narrative, and settings.

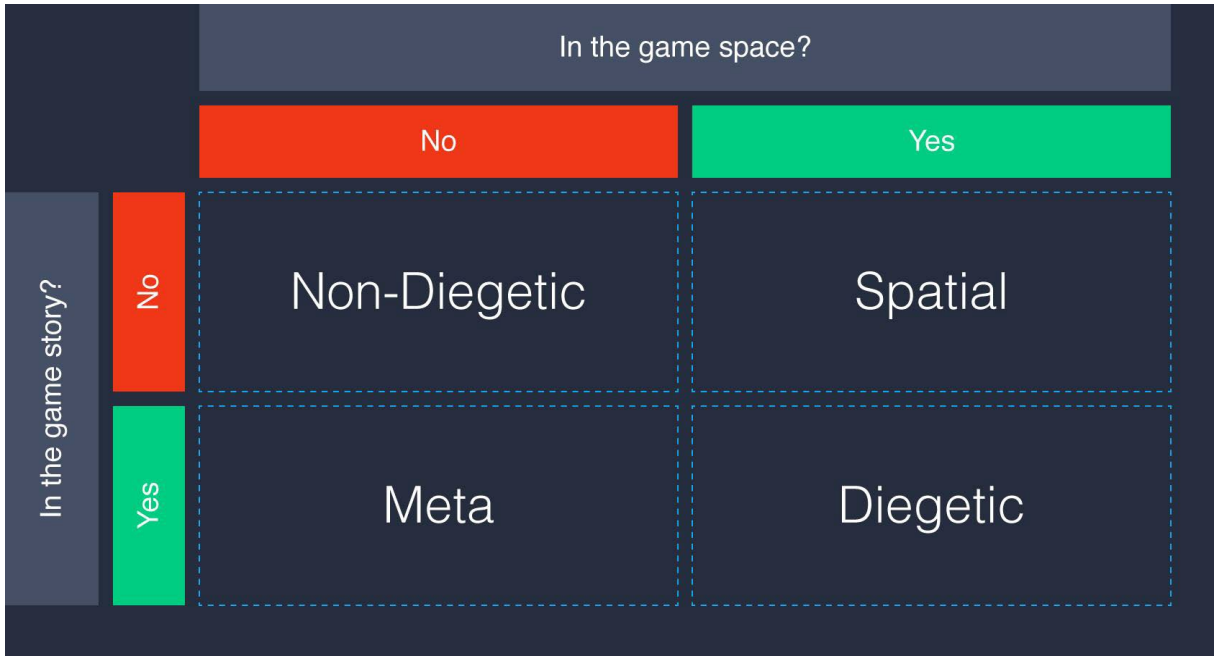


Fig. 2 Table of GUI types and uses [11].

- The GUI can be seen as **diegetic** (appearing in the game space - as part of the narrative) or **non-diegetic** (outside the game space and narrative – in the player’s world) [11].

Gestalt strategies

A. Reducing elements to basic shapes

Fig. 3 Icons for male/female bathrooms [23].

- Results in a type of ‘visual shorthand’, as in use of symbols, icons, pictograms.

B. Using positive and negative space

Fig. 4 Positive and negative space, “Brave” by Pixar poster [12].

- Overlapping elements create ambiguity, present additional perspectives.

Gestalt strategies (continued)

C. Using Pattern

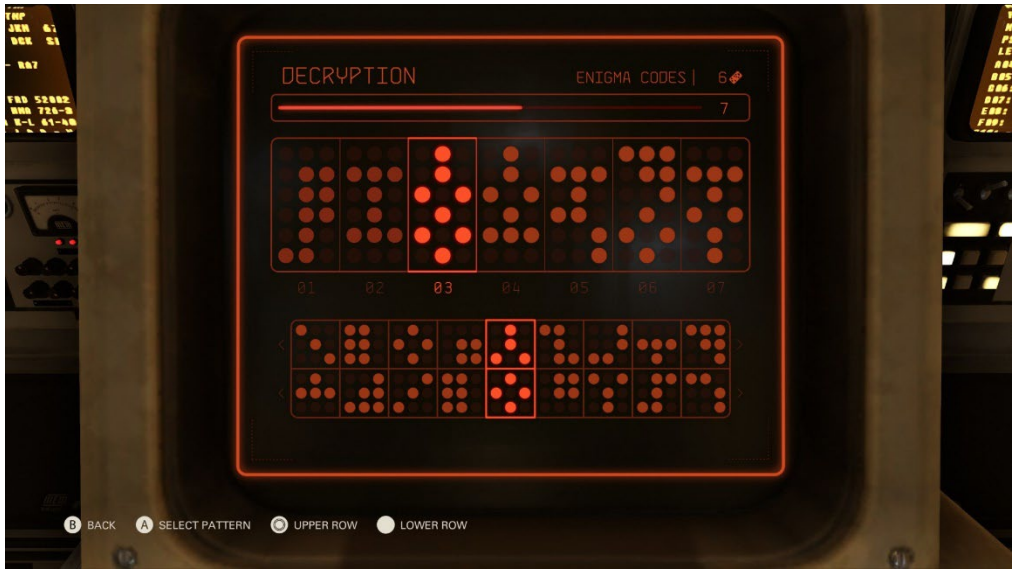


Fig. 5 Example of a puzzle Pattern in “Wolfenstein II: The New Colossus” by Bethedsa Softworks [21].

- Powerful - creating continuity and regularity of shape and behaviour.
- Dynamic - deliberate disruption of order is intended.

D. Using ‘the known’

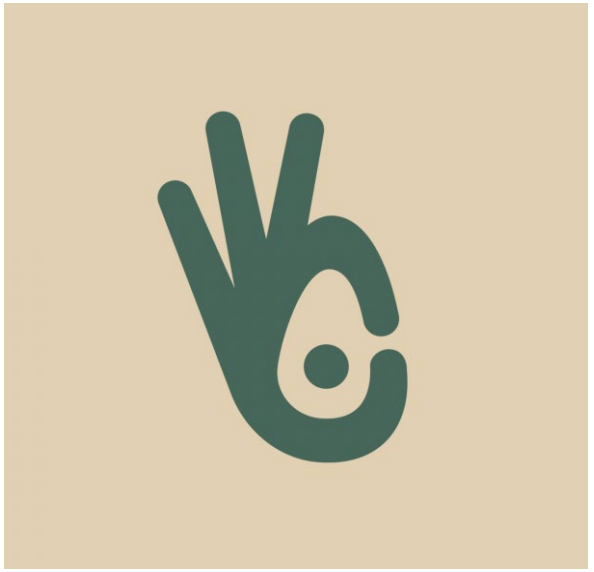


Fig. 6 “The Good Avocado” logo [22].

- Links and associations with known shapes.
- Pulls together multiple meanings into singular graphics.

III.
An analysis of Gestalt principles in games using grouping modes

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Relating Gestalt Principles to GUI

- As the GUI in a game is the **connection point or bridge between game and user**, developing a UI which is aesthetically pleasing, functional and easy to operate is crucial to **user engagement**.
- It follows that consideration of Gestalt Principles in relation to the GUI would enhance comprehension, by **encouraging simplicity** and efficiency of messaging.
- We selected a number of popular and well-designed computer games, across different genre/platforms, to investigate how Gestalt Principles work across the GUI.

Grouping modes - analysis

A. Proximity

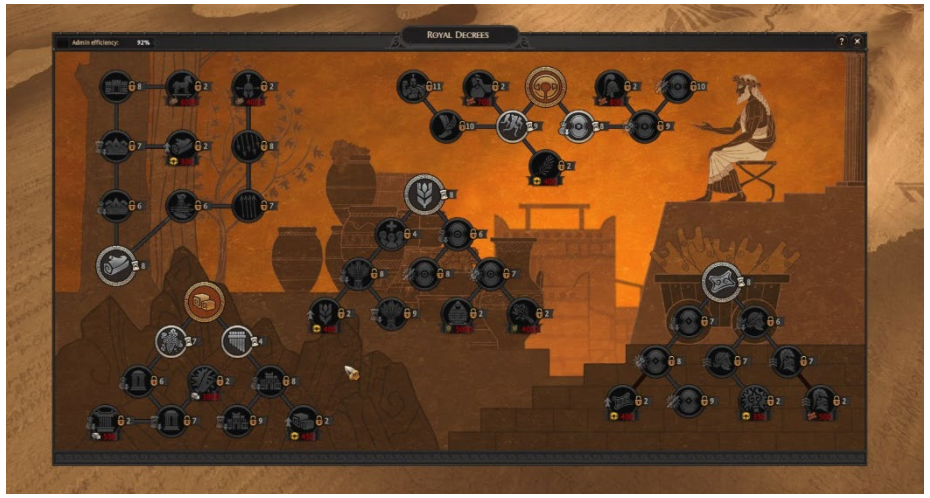

Fig. 7 Example of the Proximity principle in “A Total War Saga: Troy [17].

- Skill sets divided into areas.
- We can clearly ascertain what elements belong in which groups.

B. Similarity

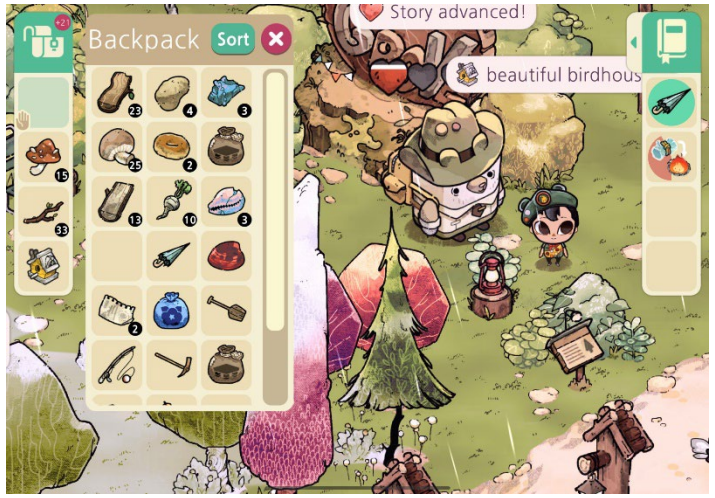

Fig. 8 Example of Similarity from “Cozy Grove” by Spry Fox [15].

- Similar shapes repeated throughout: group, indicate specific information, and/or apply hierarchy.

Grouping modes – analysis (continued)

C. Symmetry

Fig. 9 Example of Symmetry from “Fortnite” by Epic Games [18].

- Creating balance in design, or sense of neutrality.
- Often made on a grid system for spatial consistency.

D. Simplicity

Fig. 10 Example of Simplicity, UI text and icon elements in “Firewatch” by Campo Santo [16].

Fig. 11 Example of Simplicity, icons in a map legend from “Anthem” by Bioware games [13].

- Simplicity in symbology.
- Clear space, few elements.
- Icons for Map Legend provide information without clutter.

Grouping modes – analysis (continued)

E. Continuity

Fig. 12 Example of Continuity, showing a blue, continuous driving line (arrows) from “Forza Horizon 5”, by Playground games [20].

- Continuous line directs us to drive a particular way or direction.

F. Closure

Fig. 13 Example of Closure from “Anthem” logo by Bioware games [13].

- We read the text, despite gaps.
- A sense of time or completion is visualized, here in a long bar structure; anticipate closure.

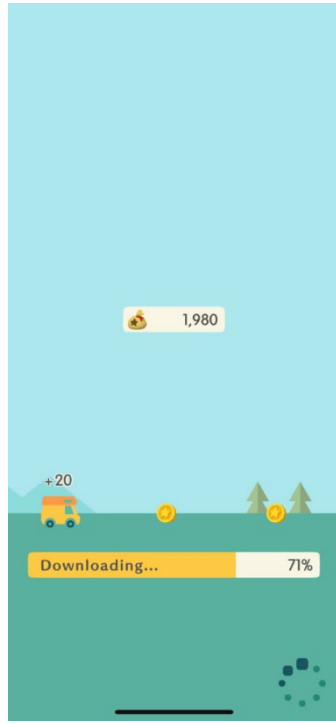

Fig. 14 of Closure from “Animal Crossing: Pocket Camp” by ND Cube/Nintendo, download bar [19].

IV.
Analysis of Gestalt principles as utilised in game UI

Underutilised principles/elements

Figure/ground ambiguity

- We may see this principle used for in-game visuals or in static marketing for games.
- It could be argued that creating ambiguity is not a goal of GUI design, due to the implicit interactivity, rather designers aim for:
  - symmetry
  - legibility
  - clarity
- Therefore, a more utilitarian design response is desired.
- Outcome: direct communication will enhance comprehension and ease of decision-making for the user, ambiguity will possibly confuse.

Review of Gestalt principles in GUI

- Our paper details to what extent the GUI designs from selected games show evidence of Gestalt principles.
- The consensus was that the games we examined all displayed use of Gestalt grouping modes (Section III), despite varying genre and platform.
- Certain Gestalt grouping modes such as Proximity and Similarity are used very generally throughout all the games we analysed.
- Others serve specific purposes (Closure or Continuation in a loading icon, Common Fate shown in directional menus) and may have an ‘action’ base rather than a static design element.
- Computer games are a media in which the principles of the Gestalt can be easily observed. The interactions required of the user demand we consider the visual perceptions, prior knowledge, and different ways of seeing of the player.

Conclusion:

- The analysis presented in this paper was conducted on small sample of an array of popular games, across multiple genres and platforms, with the focus on to what extent the Gestalt Principles of design, in particular Gestalt grouping modes, were present in the GUI.
- Our contention is that from analysis of these examples Gestalt grouping modes are all used to some degree in GUI design, with only the concept of Figure/Ground ambiguity proving potentially problematic to comprehension due to the interactive nature of games.
- This initial review gives us insight into the use or absence of Gestalt principles in games from a broad perspective and indicates that utilizing grouping modes can increase positive user experiences with game GUI, by presenting information to the user in a logical and rational way.
- Future studies may further investigate patterns of viewing related to spatial relationships in game GUI, or the relationships between Gestalt principles in game GUIs and commercial success, by doing a market analysis.

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