

Roguelike Ancestry Network Visualisation: Insights from the Roguelike Community

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ABSTRACT

Idea networks are inherently illustrative of the domain knowledge they seek to capture. They provide pathways to retrace known paths, and to explore the unknown. In this study, we conceptualised an idea network of 639 roguelike games, using data collected from *RogueBasin* and other sources, and conducted a user study for designer insight. Study participants interacted with three idea network visualisations that support exploration of design influence, accompanied by a brief historical context of roguelike games, and our design process of visualisations. The study uncovered 6 classes of insights from game developers: thinking in networks, insights on data consistency, accessibility and usability, visualisation preferences, exploring related games, and data contributions from the community. The study is limited by the data sources available about design influences, acknowledging that idea networks are only a partial representation of the full picture, which cannot be known. However, this paper shows that even a partial idea network can be useful for exploring the ancestry of roguelikes and their design influences. It also showed how idea networks can facilitate knowledge sharing through online conversations and new lines of inquiry.

CCS CONCEPTS

• Human-centered computing → Interaction design theory, concepts and paradigms

KEYWORDS

Roguelike, Idea Network, Game Design, Inspiration.

1 Introduction

NetHack [14], a classic ASCII-based roguelike, to our knowledge is the oldest videogame that still receives updates today, counting nearly 31 years of development. There are contenders for claiming the longest running game to receive new updates, but none come close. *Ultima Online* [15], a popular MMORPG, celebrated their 100th release update in June 2018, the game now 21 years old. *Diablo II* [3] received ports in 2016 for supporting Windows 7 and MacOS 10.11, dating the latest release to be 16 years old. *NetHack* still runs in computer terminals in a market flooded with waves of visually stunning games, retaining a strong fanbase. The fanbase celebrates this remarkable achievement with its brilliant gameplay that takes years to master. *NetHack* is maintained by a distributed international team of developers on the net, hence its name. *NetHack* defines this distinctive and popular genre of roguelike games.

In this paper, we present a novel data visualisation resource for exploring a large collection of roguelike games arisen from a systemic, research-through-design process [23]. The research frames not on the player or specific game series, but on design influence in the collective roguelike genre. Although a clear definition is contested [17], roguelikes are a subgenre of procedural role-playing game, typically with permanent character death. Our research method collects records of design influence to construct a systemic epistemology network of associative roguelike influences, which we call an idea network [10].

We have previously published a preliminary study to construct a smaller roguelike idea network [11]. This paper builds on that study, and offers three major additions: one, we expanded the dataset from 85 roguelike games to 639 roguelike games. Two, we greatly improved the accessibility and readability of the idea network visualisations. Three, we engaged with game developers on social media to discuss idea networks through data visualisations.

This study also evaluated the data visualisations created during this research activity. The evaluation generated six insights about

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idea networks, and how they may benefit game designers and developers to discover and explore with networked thinking. Our data visualisation generated a lot of discussions surrounding roguelike design influences in the community, and we suggest that idea networks can benefit game designers by surfacing design ancestry of roguelike mechanics, previously overlooked influences, and expand the horizon of game design exploration. The data visualisation is entirely interactive and available online, linked in Appendix A. The reader is encouraged to browse the live data visualisations first, as they complement descriptions and screenshots within this paper.

Throughout this paper, we refer to ‘game developers’ as anyone who makes videogames regardless of their discipline: designers, programmers, artists, technicians, writers, managers, producers, quality assurance, testers, product managers, business owners, and administrative staff involved in making a videogame. The paper aims to investigate knowledge generated from the interactions of game developers and idea networks. It seeks to answer the research question, “what insights can game developers extract through idea network visualisations?”

2 Roguelike Idea Network

This study follows a research-through-design framework, investigating the research question by way of designing something that can be examined formally [23]. As such, the manuscript is self-documenting about the design process. In the next two sections, we will describe the roguelike idea network and the design process, and then outline the user study and findings in subsequent sections.

An idea network describes associated influences on creative works [10]. It follows a systemic epistemology approach: strategically observing the similarities, documenting sources of inspiration, and validating invisible, unconscious influences within a wider culture. We selected roguelike games to construct an idea network for their rich, textual history available on the internet that we could draw on to develop an idea network by searching for webpages about games that reference other games. Building on our previous work to collect roguelike influences [11], we defined two kinds of influence in the roguelike idea network: *known* and *inferred* influences.

Known influences are explicitly recorded by game developers, either directly or indirectly. Game developers are universally familiar with reading or talking about other people’s sources of inspiration. We gathered known influences on the *International Roguelike Database* (IRLDB), whose data is synchronised from the developer- and fan-contributed wiki, *RogueBasin*. Each record in our data collection includes a game title, website link, project status, release date, last updated date, developer names, game themes, list of known influences, and a link to the *RogueBasin* wiki entry. More detailed description of the data can be found in Appendix A. Due to the nature of user-contributed wiki entries, some games have little to no information about their influences.

To fill in missing information, it would be time-consuming to interview each developer in person to cover a growing set of roguelike games. For completeness, we filled in approximations by using inferred influences.

Inferred influences are calculated by how often two games appear together in the same article. The calculation process deviates from the previous study [11], so we shall describe it at length. The inferred influences were calculated for every roguelike game, using *Python* and *Jupyter Notebook* [13] for reproducible research. We separated the games into three categories: *roguelike*, *roguelike-like*, and *other*. The list of roguelike games is obtained from *IRLDB*. From that list, *Diablo* [2] and *Spelunky* [21], we labelled appropriately as roguelike-like games instead of roguelike as a manual correction. Recognising that genres are fluid concepts, and difficult to pin down, we used the “Hybrid Roguelike” section on *Wikipedia* as the basis for the list of roguelike-like games. It is sufficient for the purpose of research on idea network, since it acts as a gateway to games outside of the roguelike genre. For the other games, we sourced the list of games from a user aliased “DATA_BASER”, who curated a list of every videogame title (<http://pastebin.com/EuxZMbWT>).

To speed up data collection, we automated link discovery. It was done by utilising the search engine, *DuckDuckGo* to find online articles on developer interviews, diaries and notes, post-mortems, and historical discussions for each game. Websites that are clearly game catalogues and how-to tutorials are excluded by a subsequent filter. We also automated discovery of matching *Wikipedia* entries to each game. Next, the main article content of each online article was downloaded, storing a total of 3,900 webpages. They were stored under each associated game title as our corpus. This process disregards sidebars and navigation menus, strips away any decorative styling, and ignores any audio or video content, since our code is not able to recognise content from sounds or pictures, only text.

With the prepared corpus, we proceeded to match videogames from each online article. Our algorithm considered only a match for exact names in the article, not abbreviations or short titles. This conservative approach minimises false positive matches. We kept a tally of matched frequencies, and chose a manual cutoff of top five most frequently mentioned games as inferred influences. While this approach cannot guarantee an accurate picture of influences, the chosen cutoff was sufficient to distinguish games that have influences from other roguelike games, or from mostly other genres of games. A deeper discussion on the accuracy of the dataset is given in Section 5, “Findings”.

The above collected dataset is published on *GitHub*, a free hosting service popular for open source software. *GitHub* also hosts the latest design exploration of the idea network visualisation, and forms a part of our research method to engage game developers. In the next section, we will describe the visualisation design process.

3 Design Exploration

A network comprises of nodes and links. One way to visualise a network is to draw a dot for each node, and connect them. At the inception of the research project, we started with 85 roguelike games and their inferred influences. The initial network used the visualisation library, *D3.js* [4] to perform layout computation and drawing. Figure 1 shows a screenshot of the initial roguelike network.

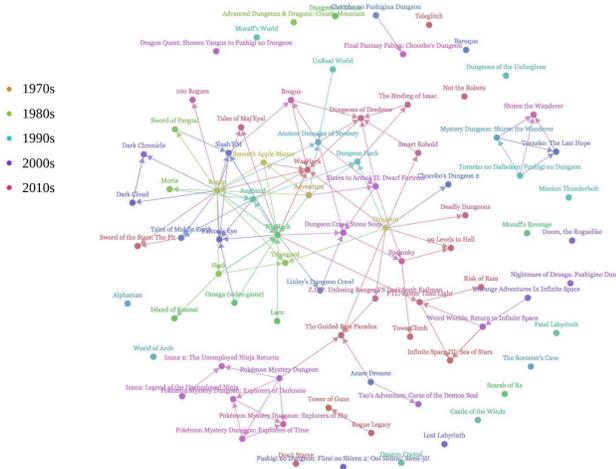


Figure 1: Screenshot of the first roguelike network in the initial analysis

We coloured each roguelike by the decade in which it was released. In the midst of green points in Figure 1, it can be observed that *NetHack* influenced games decades apart. For example, *NetHack* is built on variations of *Hack* [8], which was influenced by *Rogue* [20]. It influenced *Dungeon Crawl Stone Soup* [18], and *Spelunky* [21]. The directionality of arrows is determined by the release date. A limitation of this approach was that cyclic influences were not captured, since roguelike development can span decades.

Figure 2 shows the next iteration of the roguelike influence diagram. It was created with the drawing library, *Processing* [16] for the easy-to-compose text and shape drawing utilities. The colour encoding was retained for each game. Influence connections to non-roguelike games were added, presenting in a series of overlapping arcs. In the prototype, moving the mouse from left to right shows a different roguelike game and its influence arcs. The horizontal axis is the release year.

Roguelike and non-roguelike influences are separated by the horizontal axis: arcs above the axis are roguelike influences, and arcs below the axis are non-roguelike. This gave us the idea of dividing the arcs of influence into four quadrants: *in-genre*, *out-of-genre*, *from the past*, *to the future*, which was investigated in the previous study [11]. For Figure 2, we were working with up to 85 roguelike games and their inferred influences.

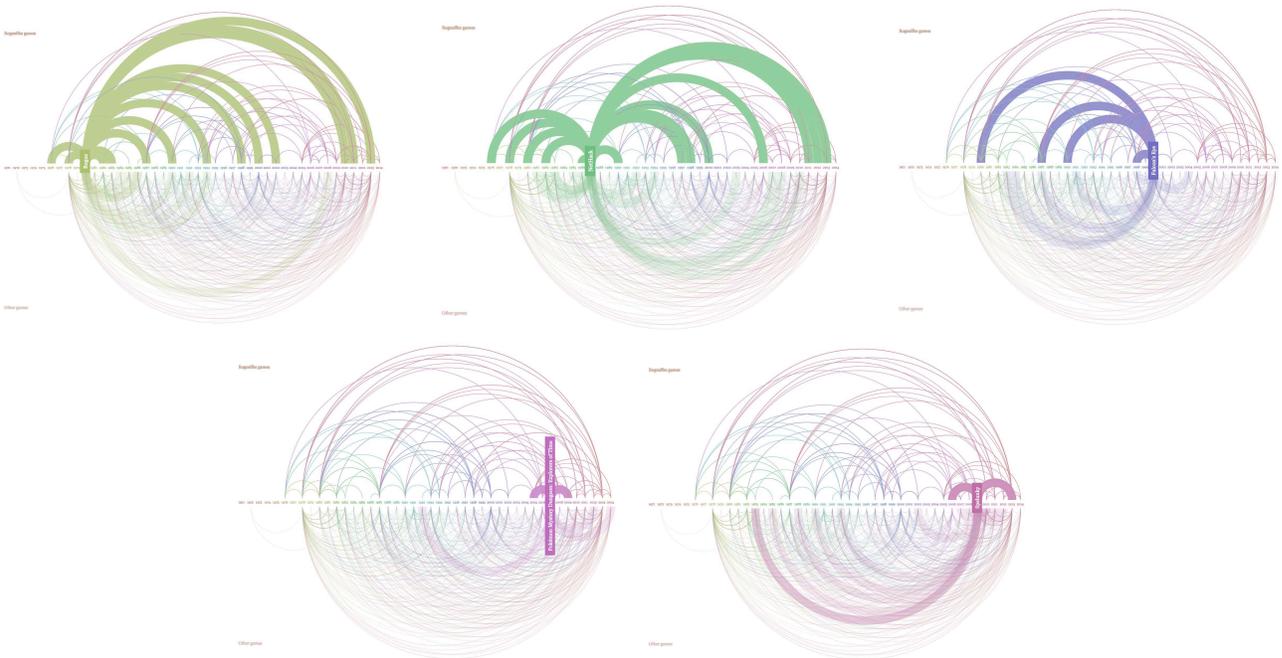


Figure 2: Prototypes of the roguelike influence arc diagrams. Top row, from left to right shows *Rogue*, *NetHack*, and *Falcon's Eye*, a GUI for *NetHack*. Bottom row, from left to right shows *Pokemon Mystery Dungeon: Explorers of Time*, and *Spelunky*. The horizontal axis is time (release year), and the arcs are inferred influence relationships.

In this study, there are 639 roguelike (and roguelike-like) games in the dataset. We not only have their inferred influences, but also the known influences as well. In preparing the data visualisations, the *Processing* prototype was ported to *D3.js*. All 639 roguelike games and their influences are overlaid and drawn in Figure 3, showing *NetHack* as the selected game for example.

Games can be selected from a dropdown input (see Figure 6). Nearly every year since *NetHack*'s release, there is at least one game reported to have been influenced by it. Every influence is listed below the diagram as interactive hyperlinks that can bring another game into focus, showing its influence arcs for exploration. On the website, visitors can also hover over an influence arc to see which two games are connected.

We plotted the *genre-influence map* (Figure 4) and the *roguelike influence timeline* (Figure 5) on all 639 games, with major accessibility improvements. For the genre-influence map, the problem was the cluttered drawing near the centre. Instead of choosing to omit games as it was the case in the previous study, we grouped overlapping games together.

The genre-influence map, as shown in Figure 4, is a scatterplot that draws each game in one of the four quadrants. The position depends on the total influences of the game: to other roguelikes,

or non-roguelikes, and to the future, or the past. Its focus is to show which games are more *influential* (further to the right), or more *representative* (further to the left). It also shows relative influences more in roguelikes or non-roguelikes (further to the top or bottom). The bigger the dots are, the more games there are in that position. On the website, visitors can hover over it with the mouse pointer, or click on one point to show every game title on that point.

We redesigned the roguelike influence timeline, shown in Figure 5. In the previous study, it had two issues. One issue was that the horizontal axis did not have much meaning—horizontal points were calculated from the genre-influence map about time—when the vertical axis was also time itself. Another issue was that many games lined up in a perfect vertical line, and it was not discernible whether an influence was for the next point, or actually connected to a point in the middle of the line.

To overcome the first issue, we chose the horizontal axis to be time, same as every other diagram presented here, and used the number of game influences as the vertical axis. To eliminate confusions per the second issue, we listed every influence below the diagram, and drew clear lines between games only from the one selected. Furthermore, roguelike games are separated from roguelike-like games, presenting the final visualisation in a scatterplot with a stacked y-axis.

In Figure 5, Major roguelike influences create visible “spotlights” in the roguelike influence timeline. *Rogue*, *NetHack*, *Angband*, *Ancient Domains of Mystery*, or *ADOM* [1], *Brogue* [19], *Tales of Maj'Eyal* [6], and *Diablo* [2] are all spotlights, shining onto the masses of newer roguelike games, guiding the gameplay and tradition mechanics.

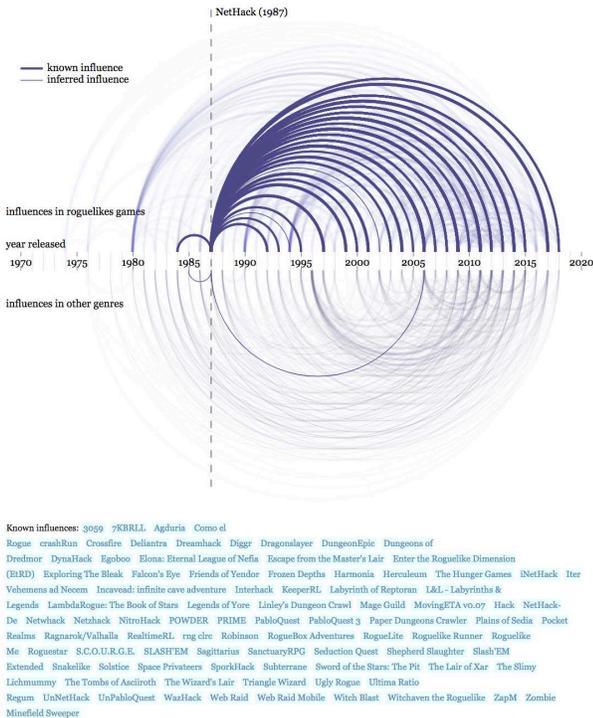


Figure 1: Roguelike influence arcs | Share link | Feedback | Download data

Figure 3: Screenshot of the *NetHack*'s influence arc diagram in Roguelike Universe ([link to live version](#))

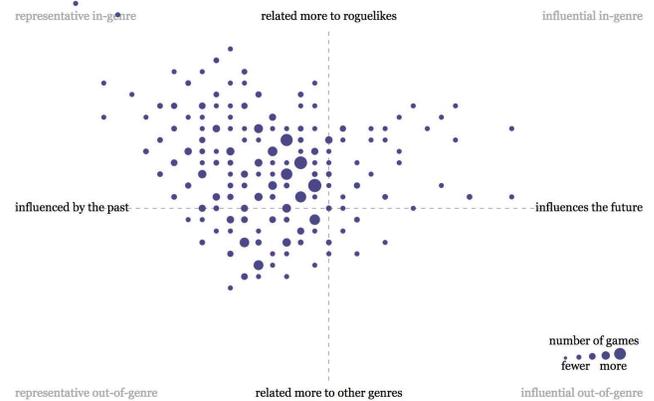


Figure 3: Roguelike Influence Map | Feedback | Download data

Figure 4: Screenshot of the *genre-influence map* produced in this study ([link to live version](#))

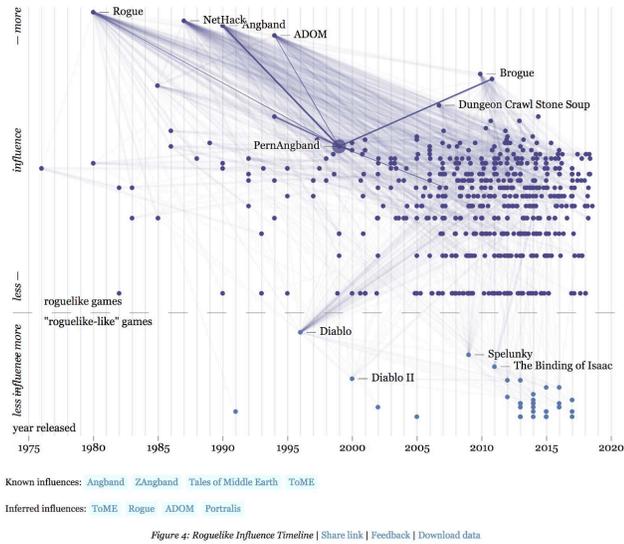


Figure 5: Screenshot of the roguelike influence timeline produced in this study, showing known and inferred influences for PernAngband, which later became Tales of Middle Earth due to copyright infringement similar to the fantasy novel series, Pern ([link to live version](#))

We encouraged webpage visitors to contribute and fill in missing data. Above the roguelike influence arc diagram, we listed the record about the developer, project website, and the release date; the data visualisation also encouraged corrections by providing a direct link to the Roguelike entry itself for viewers to contribute. An example of the missing data contribution message prompt is shown in Figure 6.

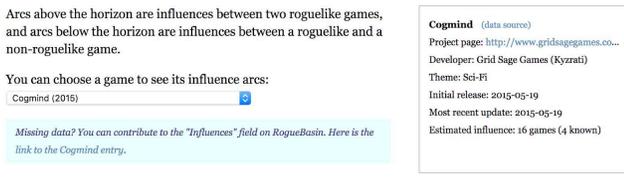


Figure 6: Screenshot of Cogmind (2015) selected, showing metadata about the game, and a prompt to contribute to any missing data

On the webpage, each figure is followed by three hyperlinks: one to share on social media, a second to a feedback form hosted on Google Forms, and a third to download the data used to generate the visualisation. The data download is specific to the visualisation itself; it offers the calculated attributes, and metadata that describes its origin. A detailed description of the data structure is listed in Appendix B. We posted these visualisations publicly online, and began to conduct the user study.

4 Online User Study

The online user study took place on a public webpage titled *Roguelike Universe: Visualising Influence*. Interactive data

visualisations of Figure 3, 4, 5, and 6 are available for visitors to explore. They are accompanied by a brief history of roguelike games, how the data was collected, and what each of the idea network visualisations represent.

The user study sought what new understanding and insights can be gained when game developers explore idea networks, and to observe the dialogues between developers. It involved data collection from an online survey asking about their experience exploring idea networks, and from the social media observing the commentaries among game developers talking about idea networks.

Participants for the study were recruited from four *International Game Developers Association (IGDA)* user groups and two roguelike development groups on *Facebook*; tweeting from our personal *Twitter* account; and from *RogueTemple* forums, the discussion site for the *RogueBasin* wiki. We also reached out to the hosts of *Roguelike Radio*, a popular podcast for the roguelike community made by roguelike game developers, who shared the online user study on *Reddit*. The study ran for three weeks.

Participants were instructed to spend five to 15 minutes with the idea network visualisations, and then fill out the online survey, or leave a comment. During the study, we watched for data corrections, any feedbacks about the visualisations in general, and updated the website accordingly. Our intention was to gradually improve the idea network visualisations and work with the roguelike community to seek comments regarding design influence, and the use of idea networks from the game developers' perspectives. The changes over the study period were negligible and only related to adding a small number of new influences.

5 Findings

From the study, we received 14 survey responses, 40 *Reddit* comments, and exchanged several personal communications with roguelike game developers on *Twitter* and *Facebook*. While these figures might be considered low for a user study recruiting from the general population, since our research targeted roguelike developers specifically the number of potential participants was limited. Data from the findings were grouped into three analyses. First, we asked the participants in the survey to rate their experience with the idea network. Next, we encoded the open-ended survey responses and *Reddit* comments, synthesising for similar kinds of responses and grouping them together until the comments were exhausted. Lastly, we set aside personal communications with game developers who reached out to us as anecdotes, acknowledging some of the design implications of idea networks.

Out of the 14 survey participants, 12 were male and two chose not to disclose their genders. Their ages ranged from 16 to 44 years old. The median age was 33.5 years (standard deviation 7.7 years). Ten participants were active game developers or students studying game development, two were not involved in game

development in any way, and two chose not to disclose their professions. A diverse range of game development skills reported include: programming, web design, *Android*, software quality assurance, administration, technical writing, data analysis, and generalist.

In the survey, participants were asked to rate their experience using the idea network visualisations on five qualitative spectrums: boring—interesting, confusing—clear, lacking—useful, slow—responsive, and inaccurate—correct.

Responses were recorded on a 5-class scale. Most participants, at least 13 out of 14, rated the idea network visualisations interesting and responsive. Half of the participants reported the idea network to be correct. Eight out of 14 participants reported neutral between lacking and useful, but the other six leaned towards useful. There was no clear consensus on whether the visualisation was confusing or clear, with five participants leaning towards confusing, and six leaning towards clear. Figure 7 shows a chart of their qualitative experience ratings using the idea network visualisations.

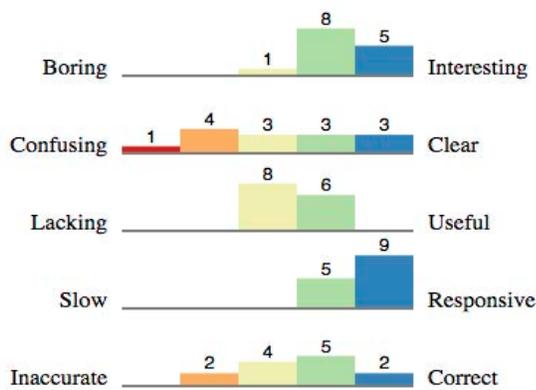


Figure 7: Qualitative experience of the idea network reported from the online survey

Analysing *Reddit* comments was a post-design realisation. We noticed a high engagement rate on the *Reddit* thread about the data visualisation shared by the roguelike community (not by the authors). Roguelike developers commented on various aspects of idea networks. The ongoing dialogue resembled a deeper conversation on design influence, the similarities in different games, and speculating where the traces of ideas came from. Game developers expressed their own preferences on the visualisations, and discussed with each other what they learned. Due to the quality of this data, the public discussions on *Reddit* were combined with the survey open-ended responses as part of the encoding process. The encoding looked for *insight* and mentions of actions stemmed from using idea networks. This study refers to ‘insight’ as new knowledge learned, change of perspectives, and speculations extrapolated by game developers in dialogues from their existing body of knowledge.

Developer insights were gathered from discussions making references to the idea network, or discussing roguelike games based on the idea networks and their own personal knowledge experience. We made two passes to encode responses, and a third time to check for any ambiguities, merging categories as appropriate. At the end of the encoding process, we generated six insights from game developers using idea networks. They are: thinking in networks, insights on data consistency, insights on accessibility and usability, insights on visualisation preferences; exploring related games, and data contributions from the community.

Thinking in networks. Many participants found it interesting to visualise the design influences between known roguelike variants. One participant said it was “interesting to see how the *Moria/Angband* variants are interrelated.” Another pointed out that “backward influences” may exist, because many roguelike games are under ongoing developments, noting that “games like *ADOM* or *NetHack* may have taken inspiration from a plethora of much younger games.” A game developer, who worked on *Cogmind*, commented on its inferred influences, “[*Roguelike Universe*] identifies *DoomRL* as a strong inferred influence, though I hadn’t played or seen it back then. I did, however, play *AliensRL* as one of my first roguelikes and that may have been an unconscious influence. In hindsight, the two are somewhat similar in fundamental style.” Like this comment, there were four other comparative comments on design influence made by others about various roguelike games.

On data consistency. One developer, who worked on *ArchiveRL*, expressed a concern on the ambiguity between inspiration and what they called “de-influence”, that a game intentionally distances itself from another game, a topic coincidentally explored briefly by Juul, “anti-inspiration” [12]. The *Cogmind* developer replied, pointing out another naming ambiguity, noting “the graph shows it’s a [known influence] that *Cogmind* influenced the new 2018 *Battletech*, although that entry on *RogueBasin* was referring to *Battletech*, the original tabletop game.” Other developers added, saying that alpha, beta, stale, and *7DRL* games should also be included in the dataset, but did not agree on how a *7DRL* game should be differentiated from its expanded version. One person pointed out that some roguelike games are developed for more than ten years, and acknowledged the difficulty to visualise such a long development lifespan.

On accessibility and usability. Participants found certain visualisation features less accessible or obscure. One person mentioned that they only found out later the ability to hover over arcs and view game titles, which made exploration easier. A few commented about font sizes being too small, and some inferred influences are repeated as known influences, both of which we acknowledged and fixed during the study period. The main comments on accessibility came from the survey, where participants expressed the desire to distinguish “more interesting” influences. One response wrote that they “would’ve liked to see

stats on the game that takes the most or the least inspiration.” A couple of comments picked up on the open data, expressing that “it’s a great dataset to work with,” and another said “it would be interesting to see [other developers’] take on this dataset.”

On visualisation preferences. Although we did not ask to compare differences in different idea network visualisations, participants expressed different opinions on whether the influence arc diagram or the influence timeline was more useful. One person wrote that they did not see what new information the influence map provided over the influence arc diagram. Conversely, another person liked the influence map, noting that “visualisation also showed relative positioning based on mentions, that’s really cool.” On the other hand, a third respondent wanted more types of visualisations, writing that “it might be nice to see a heatmap or assign a weight to the strength of the influence, or build influence chains to see a game’s influence-tree.”

Exploring related games. There were very clear agreements in what made exploring the idea network useful. Participants liked to click on related game titles, which led them to a list of other game titles to explore. Two people wanted to try related roguelike games because they were curious about them. For example, one wrote that “I don’t expect it to be great, but I think I’ll give this *Scrap* game a try just to satisfy my curiosity.” As participants shared their knowledge about design influences, comments were seen visibly from exploration, praising it was “really cool to explore, neat project.”

Data contributions from the community. This insight came only from personal interactions between roguelike game developers and myself on *Twitter* and *Reddit*. For example, the *Cogmind* developer commented earlier about the naming ambiguity for the game *Battletech*. We corrected our dataset and the visualisation the next day. They noted our correction, and edited their comment on *Reddit*. Another developer who worked on *MidBoss* [7] reached out to us on *Twitter*, saying they were pleasantly surprised that their game was on the list. They asked how they could contribute to missing influence, to which we wrote back, “You can contribute directly to the *RogueBasin* wiki.” The next day, *RogueBasin* and *Roguelike Universe* were both updated with new information that was not there before, contributed directly by the *MidBoss* developer themselves. A second memorable example was from the developer for *HyperRogue* [22], who pointed us to a series of five blog posts they wrote, detailing every influence that went into the game. We also included them in our dataset as a result.

Idea networks capture and index moments of inspiration, many parts unknown and elusive to the designer themselves. This paper showed that partial idea networks can be useful for exploration, gaining insights that serve a purpose, and that they open doors to new, curious lines of inquiry. The design method we took to examine idea networks and their usefulness in generating insights is through data visualisation, to make the abstract more explicit. This study explored potential uses for idea networks that may

resemble influences in other creative works. Nonetheless, the idea network is only a partial representation of the real world. We will acknowledge the boundary of this study, and describe its limitations.

6 Limitations and Design Implications

In this section, we will discuss some of the design implications of idea networks on the designer’s retrospective, our reflection of the idea network itself, and discuss what design implications the insights generated from the user study has.

There are two main challenges in designing an idea network: data collection, and the mechanism used to present information in a useful way. There are much more nuanced meanings behind every inspiration. Even language itself can be too limited to describe the ‘spark’. The nature of structure-free text makes automated meaning-finding analysis a challenging task. On top of that, there is no central repository that tracks the fluid occurrences of ideas, influences, and inspirations. To study idea networks, it was natural that we leveraged an existing partial database, and filled in inferred approximations with online discourse, such as the roguelike idea networks presented in this paper. Regardless of the network chosen to study, we acknowledge that the dataset is only representative of a creative domain, and not encompass every small, but equally important, detail. We also acknowledge that there is likely a new roguelike game emerging into the market on a daily basis, adding a temporal challenge to the construction of idea networks. This study benefitted much from *RogueBasin*, which holds much promise to record roguelike influences, as are the community maintaining it. Idea networks will benefit much from future studies using a different kind of data source, integrating the research findings from this paper.

Design implications of idea networks are tightly linked to the insights extracted by the designers. Idea networks provide efficiency indexing—similar to the citation index [9]—of related design influence in creative works. For roguelike game developers, they could trace influence from their own game to its predecessor, which they reported, to its predecessor, and so on, until the origin influence is reached, the idea at its first inception. Throughout this process of discovery, as recorded by the user study, there is also the parallel process of critical self-examination of influences. In a conversation context with other game developers, the process of self-examination becomes cross-examination, which then becomes knowledge sharing. The result is knowledge contribution back to the idea network itself, recorded via dialogue.

7 Conclusion and Future Work

We have presented a roguelike idea network of 639 games, including their design influences to other roguelike, roguelike-like, and non-roguelike games. This idea network of design influence is supported by three visualisations: the design influence arc, the influence map, and the influence timeline. We

conducted an online user study to investigate what insights can be extracted by roguelike game developers. Through observing discussions among game developers, we generated six classes of insights. They are: thinking in networks, insights on data consistency, insights on accessibility and usability, insights on visualisation preferences, exploring related games, and data contributions from the community.

Idea networks are a tool of research and for research, of design and for design. Roguelike game development has a rich history spanning over 40 years. Idea networks are potentially applicable beyond roguelikes. Nonetheless, while idea networks of design influence only represent a part of the known and documented influences, this study has shown that a partial idea network can generate new insights through design exploration.

Feedback from participants in the study also identified opportunities for future work. Some participants suggested alternative visualisations, such as an ‘influence-tree’, and the ability to arrange the idea network by significant statistics, or a full picture of the roguelike idea network in a ‘zoomable’ view. Some practical considerations are the potential cognitive overload displaying over 600 games in one view, providing a navigation mechanism for the viewer, and identifying a good layout without clutter. Chernobelskiy et al. [5] presented an aesthetic drawing layout inspired by the late American artist, Mark Lombardi, but the layout is force-directed, not ordinal. That is to say that the layout does not utilise ordinal axis and scales, such as the chronological release dates of roguelike games. A hybrid layout may be designed to get the best of both worlds. It is our hope to make our underlying database available for other developers to build on and extend.

Future work may also include a potential system that can generate idea networks with little human intervention, building on our approach for inferring influence. Such system should encompass appropriate rectification and correction procedures. Another type of future work is to explore alternative data visualisations of idea networks, searching for an efficient display for both leisurely exploration and scholarly research.

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APPENDIX A: Data from the International Roguelike Database

The reader is welcome to visit the latest Roguelike Universe, created and designed for Chapter 7 at

<https://spaxe.github.io/roguelike-universe/>

The International Roguelike Database (IRLDB) was made by “Z-R2” in 2008. IRLDB sources data from *RogueBasin*, a community-maintained wiki for roguelike games. The database appears to update daily automatically.

As of writing this paper, the most recent data download we made was on 21 August, 2018, using this exact search link: <https://forums.roguetemple.com/irlldb/index.php?i=47e013c>.

The date output format was “yyyy/mm/dd”, which requires manual override. The data include roguelike games that are “alpha”, “beta”, “stable”, “major”, “unknown”, and “Angband variants.” It returns the following fields: “website”, “type”, “release date”, “update date”, “developer”, “theme”, and “influence.” The table is sorted alphanumerically by game title before being exported.

Keen explorers will notice that the data contains numerous errors, especially on the date fields. We consistently see invalid dates like “2005/86/93”. Our estimate is that nearly 100 games have invalid dates. Fortunately, most of them had at least a valid year, which is used.

We manually cleaned up the dataset by two items. The first item is to remove influences that were not games at all, even though some are quite specific (such as “J.R.R. Tolkien’s Middle-Earth”), they are not in scope of the roguelike idea network; and remove influences that were non-specific (such as “horror movies”). The second item is to remove games that did not have a valid release date or a valid update date at all for consistency in the visualisation.

The hand-cleaned version, along with the notes, can be found online here:

<https://docs.google.com/spreadsheets/d/1cUmwMHQQWkPTh-89L9QDVC25QOCAHqjvqZYUofzmQOk/edit>

APPENDIX B: Data Structures for Downloading

Roguelike Universe has an open data license, Creative Commons Non-Commercial 3.0. It is our intention to give permission to give the data publicly for anyone to use and reuse in a non-commercial context, as the original data is also in the open domain, hosted on *RogueBasin*.

As of writing this paper, the data download is generative live in the web browser. While this means that a direct link to the data is not possible, it does mean that the data downloaded is exactly the same as the visualisation shows. In the future, a direct download link is possible with the help of a web hosting service outside of *GitHub*.

Each download is in JavaScript Object Notation (JSON) format. It has two fields, “metadata”, and “data”. The metadata will look something like this for every download:

```
"metadata": {
  "author": "Xavier Ho",
  "email": "contact@xavierho.com",
  "author_website": "https://jumptoglide.com",
  "github_website":
  "https://github.com/Spaxe/roguelike-universe",
  "project_website":
  "https://spaxe.github.io/roguelike-universe",
  "license": "Unless otherwise specified, Creative
  Commons Non-Commercial applies",
  "license_url":
  "https://creativecommons.org/licenses/by-nc/3.0/",
  "acknowledgement": "RogueTemple and RogueBasin
  contributors",
  "download_date": "2018-09-18T10:02:28.199Z"
}
```

The data structure is specific to the visualisation. In the *influence arc diagram*, the data is an array of influence objects, for example:

```
"data": [
  {
    "titleA": "100 Heroes: Shopkeeper of Doom",
    "titleB": "Recettear",
    "yearA": 2012,
```

```
    "yearB": 2007,
    "categoryA": "roguelike",
    "categoryB": "roguelike",
    "type": "known"
  },
  ...
]
```

In the *genre-influence map*, the data is an array of game titles, and their positions on the map, for example:

```
"data": [
  {
    "title": "3059",
    "x": 1,
    "y": 7
  },
  {
    "title": "3069",
    "x": -5,
    "y": 7
  },
  ...
]
```

In the *roguelike influence timeline*, the data is an array of games, its metadata, and influences, for example:

```
"data": [
  {
    "Name": "100 Heroes: Shopkeeper of Doom",
    "RogueTemple":
    "http://roguebasin.roguelikedev.com/index.php?title=100%20Heroes",
    "Link":
    "http://www.bay12forums.com/smf/index.php?topic=105835.0",
    "Status": "alpha",
    "Released": "2012-01-01",
    "Updated": "2012-01-01",
    "Developer": "Paul Wright",
    "Theme": "Economics/Trading",
    "Influences": [
      "Recettear"
    ],
    "Inferred_Roguelike_Influences": [],
    "Inferred_Roguelike_Influences": [],
    "Inferred_Other_Influences": [],
    "type": "roguelike",
    "influenceCount": 1
  },
  ...
]
```

Anyone can download each figure’s data by clicking on “Download Data” below them on *Roguelike Universe*: <https://spaxe.github.io/roguelike-universe/>.