# Understanding the Design Space for Animated Narratives Applied to Illustrations

Yang Shi iDVX Lab, Tongji University yangshi.idvx@tongji.edu.cn

Lingfei Xu University of the Arts London xulingfei2100@gmail.com

## ABSTRACT

Animated illustrations are a genre of graphic design that communicate a specific contextualized message using dynamic visuals. While animated illustrations has been gaining popularity across different applications, exploring them through the storytelling lens has received limited attention. In this work, we introduce a design space for animated narratives applied to illustrations. The design space combines a dimension for object types of animation techniques with one for narrative intents served by such animation techniques. We derived our design space from the analysis of 121 high-quality animated illustrations collected from online sources. To evaluate the effectiveness of our design space, we ran a workshop with 18 participants. The results of our workshop indicated that the design space can be used as a tool that supports ideation and increases creativity for designing expressive animated illustrations.

# CCS CONCEPTS

• Human-centered computing  $\rightarrow$  User interface design.

#### **KEYWORDS**

Animated Illustrations; Visual Narratives; Design Space

#### **ACM Reference Format:**

Yang Shi, Zhaorui Li, Lingfei Xu, and Nan Cao. 2021. Understanding the Design Space for Animated Narratives Applied to Illustrations. In CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI '21 Extended Abstracts), May 8–13, 2021, Yokohama, Japan. ACM, New York, NY, USA, 6 pages. https://doi.org/10.1145/3411763.3451840

# **1** INTRODUCTION

Illustrations, as a genre of graphic design, use a visual language to communicate a specific contextualized message [22]. They have been widely designed for integration in digital media such as websites, mobile applications, games, and interactive storytelling in recent years. While creating illustrations, designers have increasingly

CHI '21 Extended Abstracts, May 8-13, 2021, Yokohama, Japan

Zhaorui Li iDVX Lab, Tongji University zhaorayli@tongji.edu.cn

Nan Cao iDVX Lab, Tongji University nan.cao@gmail.com

used *animation* to explain an idea, bring stories to life, or convey an emotion [2, 8, 23, 26]. As an emerging medium, animated illustrations usually present short stories using dynamic visuals, typically lasting less than 15 seconds. Such illustrations can facilitate comprehension and augment engagement [8, 28], making them appealing to a broader audience. For example, *Leap Year 2016* [34], a Google Doodle illustrated by Olivia When, uses a leaping bunny to *explain* the added day in 2016, February 29. With the growing popularity of animated illustrations across different applications, a demand for methodologies to support applying animation to illustrations has emerged.



Figure 1: Leap Year 2016 [34]: (a) Bunnies 28 and 1 are sleeping, then (b) Bunny 29 is leaping into the air, and (c) Bunny 29 falls asleep between Bunnies 28 and 1.

Prior work on animated illustrations in the Human-Computer Interaction (HCI) community has focused on designing authoring tools to support their creation [17–19, 31]. Researchers have also conducted empirical studies to understand the design of animated GIFs [4, 16, 29]. For example, Bakhshi et al. [4] explored the impact of image quality, motion, animation duration, and presence of faces of animated GIFs on user engagement. However, few structured analyses or systematic reviews exist for understanding narrative design patterns in animated illustrations. Such knowledge can be instrumental in allowing illustrators and designers to create expressive and engaging narratives using this medium.

To bridge such a gap, our work explores the design space for animated narratives applied to illustrations via three complementary methods. First, we collected a corpus of 121 animated illustrations from a range of online sources and identified common design patterns that capture the way animation techniques create narration. Second, we constructed a design space that systematically describes these design patterns, which is informed by coding the object types of the identified animation techniques, combined with the narrative intents served by these animation techniques. Third, we conducted a workshop consisting of 18 participants to evaluate the effectiveness

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the author(s) must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

<sup>© 2021</sup> Copyright held by the owner/author(s). Publication rights licensed to ACM. ACM ISBN 978-1-4503-8095-9/21/05...\$15.00 https://doi.org/10.1145/3411763.3451840

of our design space. We also developed an animated illustration explorer<sup>1</sup> as teaching material for the workshop. The explorer shows a set of 31 animation cards derived from our design space and the participants were instructed to apply these cards to designing and crafting animated illustrations. The results of the workshop indicated that our design space can provide useful and inspiring suggestions for creating animated narratives in illustrations.

# 2 DATA COLLECTION AND ANALYSIS

In this section, we describe our methodology used to identify common design patterns of animated narratives in illustrations. This methodology consists of a multi-step process, including collecting a corpus of high-quality animated illustrations from online sources, analyzing the corpus to derive an initial design space, and validating the design space by creating animated illustrations with a group of domain practitioners.

# 2.1 Data Collection

Our data collection was motivated by the pilot corpus from D4U [11], which presents 20 inspiring animated illustration examples and summarizes a set of benefits that animation brings, e.g., supporting stylish look, transferring key messages, and adding emotional appeal. Based on the corpus, we formulated an initial understanding of animated illustration design and investigated its roles in storytelling. Then, we expanded the corpus with 106 animated illustrations from popular illustration galleries such as Google Doodle, Behance, Dribbble, and Folio. To further increase the diversity in animation and illustration designs, we collected another 82 animated illustrations from well-known illustrators such as Jona Dinges, Sparrows, and Anton Tkachev. We also established three inclusion criteria to ensure the representativeness of our corpus; it should (1) include no transitions, as our research focus is on illustrations of one scene, (2) depict at least one character, (3) use at least one animation technique, and (4) follow the form of storytelling. As a result, we arrived at a corpus of 121 animated illustrations, whose applications include user interfaces, advertising campaigns, and ebooks. Overall, the average duration of the collected animated illustration is 4.61 seconds, ranging from 0.25 seconds to 18 seconds. Notably, the goal of collecting the corpus is not to be exclusive but to include animated illustrations that reflect recent developments in the field and that are of interest to the community.

### 2.2 Analysis and Validation

Two researchers with design-related backgrounds independently coded the 121 animated illustrations using thematic analysis [7]. Specifically, we coded the animated illustrations from three aspects, including (1) what animation techniques are used [33, 35], (2) what are the object types of these animation techniques, and (3) what narrative intents are served by these animation techniques. To identifying narrative intents, we conducted a literature review from cross-domain fields including illustration/comic design [2, 3, 24], animation design [8, 14, 32], cinematic storytelling [9, 10], and narratology [25, 27]. After the literature review, we extracted a set of key narrative intents such as animation can help explain key ideas in a story [2]. Through multiple coding iterations, we

identified 35 animation techniques categorized by 4 object types and 5 narrative intents, which constitute our initial design space.

We also validated and fine-tuned our design space by creating animated illustrations with a group of five professionals, who have 3-5 years of work experience in design. We first asked the five designers to present the illustrations they had worked on and introduced our design space to them. They were encouraged to use the design space in their ideation process of creating animated narratives in their illustrations. We then observed the manner by which they applied the design space and recorded their comments as well as questions. Finally, we conducted an informal interview with each designer to collect feedback on our design space and suggestions for categories that were not originally observed. For example, two designers suggested dividing the narrative intent of Mood into Emotion and Atmosphere, as these two categories are mutually exclusive while both relevant to affective experience. Redundant or related animation techniques were also merged. The validation resulted in 31 animation techniques categorized by 4 object types and 6 narrative intents. The final coding scheme was cross-checked and discussed to refine the design space as well as ensure that all codes are interpreted similarly by both two researchers. Last, we coded the 121 animated illustrations and reached a Cohen's Kappa of 0.94. We then discussed the mismatches and reached a 100% consensus.

#### **3 DESIGN SPACE**

Through the analysis of the 121 animated illustrations in our corpus, we identified common design patterns of animated narratives frequently found in illustrations. Then, we developed a design space that systematically describes these design patterns. The design space combines a dimension for *object types* of the animation techniques with a dimension for *narrative intents* that served by the animation techniques, as shown in Figure 2.

#### 3.1 Dimension I: Object Types

Objects refer to composable primitives of an illustration that support storytelling. The object dimension describes *what* type of composable primitives that animation techniques can be applied to. We propose the following set of four object types, delineated by their role in an animated illustration and their unique characteristics.

*Character.* The character of an illustration can be a person, creature, animal, plant, or item that performs the actions and speaks dialogue, moving a narrative along its plot (Fig. 2 ). For example, characters can use body movement (e.g., Fig. 2 No.1-2) or facial expression (Fig. 2 No.5) to establish nonverbal communication.

*Environment.* Regarding this object type, the environment of an illustration consists of the physical location, weather, or social surroundings of a narrative (Fig. 2 ). Examples include weather-based effects such as falling snow (Fig. 2 No.16) and blooming flowers (Fig. 2 No.18).

*Embellishments.* Animation techniques applied to another object type manipulate the embellishments added to a character or the environment, such as props and items, which help build a narrative's mood, plot, and character development (Fig. 2  $\leq$ ). For example,

<sup>&</sup>lt;sup>1</sup>https://illustrationexplorer.idvxlab.com

Understanding the Design Space for Animated Narratives Applied to Illustrations

CHI '21 Extended Abstracts, May 8–13, 2021, Yokohama, Japan

ID	OBJECT ANIMATION		TIME						-))-	C.				
1	8	Run							2	1	1			1
2	8	Walk		/~					3	1	2	1		
3	8	Bounce				PL			2	1	~	2		
4	8	Move along a path		~	$\sim$	$\sim$	$\frown$		2				2	1
5	8	Facial expression				v.	v.				1	7		
6	8	Wave				-		-	2					
7	8	Wag		3	7	1	5	3	4			2		1
8	8	Touch		:	:	:	: 🧨	:		1	1			
9	8	Throw in		· v	- 1	· · ·	-		2		2			
10	8	Push			-			~	1		1			
11	8	Pull		4	4	4	<	C	3		1			
12	8	Flap		1	7		~	4	5	1				1
13	8	Cycle		7	2		ø	2	2					
14	8	Slide				1 - 1 <b>1</b>	1.00		2					
15	8	Follow through											4	
16	٢	Fall		1413	1414								7	
17	٢	Scroll		1 <u>4 4 4</u> 4	<b>±</b> , <b>±</b> , <b>±</b> , <b>±</b>	1 <u>4 4 4</u> 1	<b>*</b> , <b>*</b> , <b>*</b> ,	1 1 <u>4 4 4</u> 5					3	
18	0	Bloom		•	٠	<b>\$</b>	Ø	Ś						
19	٢	Ripple		~ ~									3	
20	0	Sway		ldle	× (Alc	ldle	× (Ke	ldle					3	
21	0	Slow in and slow out						1					2	
22	0	Float			<b>.</b>		<b>:</b>		4					
23	9	Wiggle			"	( <b>1</b> )	<b>"</b> ]		2	1		1		
24	9	Spin			-	•			2	1			3	
25	$\bigcirc$	Bend			Â.	<b>.</b>		<b>.</b>		1			3	
26	0	Glow			+ <b>=</b> *_+		·+∎*,						2	3
27		Particle system		÷	4								2	
28		Grain reducer		L.	£34	Lo	£=1	L					4	
29		Unfold			Q	Q	$\bigcirc$	*		3				
30	•	Explode			举	A.		*		2				
31		Symblize		7 24	ash b		, " " b	9					3	
Objec	t Types				Narrative	Intents								
Character Character				C Emph	asizing an Ac	😚 Explaining a	Explaining a Concept			Advancing a Plot				
Special Effect			5	Communicating an Emotion			Ø Creating an Atmosphere			Creating Imagery				

Figure 2: Our design space for animated narratives applied to illustrations. Each cell is colored based on the frequency of this narrative intent being found served by specific animation techniques by coding our corpus.

slowing in and out depicts the states and speed of a moving object (Fig. 2 No.21).

*Special Effects.* Last, the special effects of an illustration refer to illusions or visual tricks that simulate the imagined events in a narrative (Fig. 2 (3)). Examples include symbol-based effects using music notes or sleeping symbols (Fig. 2 No.31).

#### 3.2 Dimension II: Narrative Intents

The design of an animated illustration is rooted in a narrative intent, which has either been generated by the illustrator or a commercialbased client to fulfil a particular task. Narrative intents such as explanation and emphasis can be served by animation techniques to help assemble a group of graphic objects into an expressive and memorable narrative. By analyzing the 31 animation techniques through the storytelling lens, we identified 6 categories of narrative intents, as shown in Fig. 2. It should be apparent that most animation techniques fulfil more than one narrative intent at a time.

*Emphasizing an Action.* Emphasis is one of the most supported narrative intents in animated illustrations and plays a fundamental role in animation design [32]. It adds dynamics to a narrative by simulating specific motions, movements, or gestures. For example, animation techniques such as *run*, *walk*, and *wave* can be used to represent the actual figure. On the other hand, squash and stretch can be added to animation techniques such as *slide* and *wiggle*, presenting exaggerated and imaginary motions without strictly following physical rules.

*Explaining a Concept.* Another class in narrative intents is explanation, which pertains to a sequence of actions that used to introduce abstract concepts or complex processes [26]. Such intent is often used for an educational purpose by making abstract concepts emerged from a narrative directly observable. In Leap Year 2016, a sequence of animation techniques including *bounce* and *push* is applied to the character, bunny 29, to explain the concept of the added day. Animation techniques such as *spin* and *bend* can also be added to embellishments to support explanation.

Advancing a Plot. Advancing a plot is a narrative intent that used to depict the ongoing event and thus trigger the anticipation of consequent events. It is achieved by addressing the relationship between different elements of a narrative and is extensively used in animation design for visual discourse [8]. For example, Lunar New Year 2015 [12], a Google Doodle, uses animation techniques such as *run*, *facial expression*, *wag*, *wiggle*, and *particle system* to depict how the character, a sheep, celebrate lunar new year's eve.

*Communicating an Emotion.* Communicating an emotion constitutes another common narrative intent served by animation techniques applied to illustrations [20]. It is frequently presented through *facial expressions*, allowing the audience to develop empathy with the character of a narrative. Fig. 2 shows that body movements such as *bounce* and *wag* can also achieve similar effects. We also observed animation techniques applied to special effects such as *symbolize* (e.g., heart) can also be used as a proxy for emotion. *Creating an Atmosphere.* Atmosphere refers to the aura of mood that surrounds a narrative (e.g., relaxation, reminiscence, horror) [6]. It is often established through the environment to evoke emotional responses from the audience. Creating an atmosphere is commonly used in cinematography and is considered as one of the essential features of cinematic storytelling [1, 30]. In animated illustrations, several animation techniques applied to the environment are found to create an atmosphere, as shown in Fig. 2. Examples include *falling* rain, *blooming* flower, and *rippling* water.

*Creating Imagery.* Visual imagery uses a metaphorical and symbolic language to formulate or modify attention and perception [13]. Creating animated imagery in illustrations can introduce a novel perspective for the audience to read an illustration and thus improves its memorability, as shown in Fig. 2. Such intent can launch the audience into the experience of riding a hot air balloon or waking up by annoying alarm clocks. Here, illustrators create animated imagery of *flapping* flowers or a *wiggling* clock with *symbolized* noises to achieve these effects.

#### 4 WORKSHOP

We conducted a workshop to evaluate the effectiveness of our design space on creating animated illustrations.

#### 4.1 Participants

We recruited participants via the social media platforms of our lab. Our recruitment material demonstrated that we were looking for designers or illustrators who are experienced in illustration and animation design. 18 participants (10 females) aged between 18 and 26 (M = 22.89, SD = 2.18) were recruited. The participants involve college students, researchers, and professionals from communication design, industrial design, and interactive design backgrounds. 16 out of 18 participants reported that they have experience in making animation.



Figure 3: Example of a method card from our animated illustration explorer: (a) front and (b) back.

## 4.2 Teaching Material

Inspired by the Napa Cards [5] and IDEO Method Cards [15], we also developed an animated illustration explorer, which was used

Understanding the Design Space for Animated Narratives Applied to Illustrations

as teaching material for the workshop. The explorer is available at https://illustrationexplorer.idvxlab.com and the participants were encouraged to browse it when designing animated illustrations. In the explorer, the design space is presented as 31 method cards, each describes one animation technique, as shown in Fig. 3. Each of the cards shows its name, a GIF demo, a textual description (how and why) on its front, and an exemplar illustration on its back. The color of each card encodes the category of its narrative intent while the icon beside the card name denotes the corresponding object type. We also add an index number to each card at the bottom left corner. To interact with these cards, users can hover on a card to play its GIF demo or click the "View Example" button to check its exemplar illustration on its back.

### 4.3 Visual Material

We provided the participants with visual materials as inspiration for creating animated illustrations. The visual materials were presented as illustrations and categorized into three groups including characters (e.g., boy, cat), embellishments (e.g., umbrella, laptop), and environments (e.g., forest in a storm, coffee shop in the morning light), with eight illustrations in each category. The participants were allowed to select one illustration from each of the three categories and form an idea of the story behind their design accordingly.

#### 4.4 Procedure

The workshop was composed of two phases: (1) a *design* phase for the participants to design animated illustrations using storyboards and (2) a *craft* phase to craft animated illustrations based on the storyboards they have drawn using video editing tools.

Design Phase. The design phase started with a 15-minute introduction explaining the concepts of animated illustrations and storyboards, followed by a 30-minute tutorial describing the use of our design space and the explorer. After the tutorial, we presented sample visual materials and asked each participant to perform a 15-minute warm-up storyboarding exercise. In their storyboards, the participants were instructed to label the animation techniques they had applied and sketch the expected effects they would like to achieve. Then, we described the formal visual materials in detail and instructed the participants to start sketching a storyboard based on the illustrations they had selected. They could browse the explorer as a reference and were given one hour to finish the storyboarding process.

*Crafting Phase.* In the crafting phase, we first gave a 30-minute graphic design tutorial (Adobe AI) and a 30-minute video editing tutorial (Adobe AE). The participants were then encouraged to create animated illustrations based on their storyboards using these tools. When finished, each participant had an opportunity to present and explain his or her animated illustration. The workshop lasted about 5 hours. After the workshop, we sent out a questionnaire regarding the usefulness, ease of use, and satisfaction [21] of the design space and conducted a semi-structured interview with the participants. For both phases, audio and video were recorded for later analysis.

## 4.5 **Results and Findings**

We collected 18 storyboards with 18 animated illustrations, one pair per participant from the workshop. Two researchers independently coded all the storyboards to investigate the animation techniques used in these storyboards. Overall, each participant used 4 cards on average and 18 out of 31 cards were used in total, where *Creating an Atmosphere* is the most popular intent served. To better explain the quantitative and qualitative results, we now discuss the comments and findings received from the workshop.

The Design Space Supports Ideation. Overall, the participants indicated that our design space is effective on providing design suggestions (M = 4.06, SD = 0.89). The participants appreciated its usefulness and practicability, "it's truly inspiring" (P12), "it's a great ideation tool" (P8). They also provided positive feedback on the ability of the design space to provide novel design inspirations, "it allows to think outside the box and explore more design possibilities" (P7), "it can definitely increase productivity at work... with this tool in hand, I can picture confidently building an animate illustration rapidly and I can picture the design teams at my company adapting these techniques into their daily practice." (P14). On the downside, we found that one participant was negative about the usefulness of the current design space and suggested that more instructions about how to combine the elements of an illustration and animation techniques should be added.

The Design Space Increases Creativity. 12 out of 18 participants noted that the design space can stimulate creativity and they would use it in their future work. They suggested that the design space is able to augment the "expressiveness" and "engagement" of animated illustrations, "the animation techniques related to conveying emotion inspired me and I attempted to combine different techniques to achieve that effect" (P4). We also found that the participants creatively used our design space. For example, 7 out of 18 participants used one card in combination with others without instruction. For example, one participant stated that they borrowed the idea of move along a path and applied it to a balloon, "it creates a feeling that one's success is the result of constant effort" (P18). These findings showed that the participants did not rely on the cards we had provided them. Rather, they explored new ideas and patterns inspired by our design space.

The Design Space Augments Expressiveness in Animated Illustrations. The participants commented being surprised by the fact that our design space can augment expressiveness in resulting illustrations. P15 stated, "it brings a harmonious feeling to the design, as all elements in the design are well-coordinated and well-organized." P12 commented, "using the design space helps effectively emphasize the key ideas and concepts in the story." We also observed that the participants paid more attention to the storytelling of their design, "I used to focus on the animation itself and think those fancy effects can make my work more eye-catching. Using this tool helps reflect on and improve my design skills" (P15), "I think the essence of designing an animated illustration is about creating expressive visual narratives... The cards can be used as guidelines for highlights in a story" (P18). All of the participants suggested authoring and coordinating the different elements of illustrations is challenging, especially most video editing tools are not customized for illustrations.

The Explore Acts as A Handy Toolkit. All participants noted that the explorer is easy to use (M = 4.31, SD = 0.68). They enjoyed the user interface and user experience of the explorer, "it's aesthetically well designed and user-friendly. I can do search or filtering, which definitely improve my work efficiency" (P5), "what I really like about this tool is that it provides exemplar illustrations, so I know exactly how it looks like and learn by example" (P16). We also found that the participants were impressed by the usefulness and flexibility of the explorer, "it lowers the bar of design. I'm really proud of what I've created in this workshop and creating it in such a short time gives me a sense of fulfillment" (P14), "by checking these examples I know where to start. Take the rain effect as an example, I tried to build upon this effect and create my own" (P11). Surprisingly, some participants asked if the cards could be printed out to be a handy design toolkit in class and workshop scenarios.

# 5 CONCLUSION

In this work, we used a bottom-up approach of exploring and building the design space for animated narratives applied to illustrations. All of the 121 animated illustrations in our corpus can be described along the two dimensions of our design space: object types and narrative intents. The results of our workshop showed that the design space can be used as a design tool that supports ideation for creating expressive animated illustrations. Also, we considered that our design space can lower the barrier to designing animated illustrations and encourage designers to explore novel ways to communicate visual messages. Future work can include expanding our design space to involve additional dimensions and design patterns, and deploying the proposed design space in long-term animated illustration-making work.

## ACKNOWLEDGMENTS

Nan Cao is the corresponding author. This work was supported in part by the National Natural Science Foundation of China (61802283 and 62072338) and NSF Shanghai 20ZR1461500.

#### REFERENCES

- Dudley Andrew et al. 1995. Mists of Regret: Culture and Sensibility in Classic French Film. Princeton University Press, Princeton, NJ, USA.
- [2] Gary J Anglin, Hossein Vaez, and Kathryn L Cunningham. 2004. Visual Representations and Learning: The Role of Static and Animated Graphics. *Handbook of Research on Educational Communications and Technology* 2, 33 (2004), 865–916.
- [3] Benjamin Bach, Zezhong Wang, Matteo Farinella, Dave Murray-Rust, and Nathalie Henry Riche. 2018. Design Patterns for Data Comics. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI '18). ACM, New York, NY, USA, 1–12.
- [4] Saeideh Bakhshi, David A Shamma, Lyndon Kennedy, Yale Song, Paloma De Juan, and Joseph'Jofish' Kaye. 2016. Fast, Cheap, and Good: Why Animated GIFs Engage Us. In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16). ACM, New York, NY, USA, 575–586.
- [5] Lyn Bartram, Jeremy Boy, Paolo Ciuccarelli, Steven Drucker, Yuri Engelhardt, Ulrike Koeppen, Moritz Stefaner, Barbara Tversky, and Jo Wood. 2016. NAPA Cards. http://napa-cards.net/#info. Accessed:2021.
- [6] Brigitte Biehl-Missal. 2013. The Atmosphere of the Image: An Aesthetic Concept for Visual Analysis. Consumption Markets & Culture 16, 4 (2013), 356–367.
- [7] Virginia Braun and Victoria Clarke. 2006. Using Thematic Analysis in Psychology. Qualitative Research in Psychology 3, 2 (2006), 77–101.
- [8] Fanny Chevalier, Nathalie Henry Riche, Catherine Plaisant, Amira Chalbi, and Christophe Hurter. 2016. Animations 25 Years Later: New Roles and Opportunities.

In Proceedings of the 2016 International Working Conference on Advanced Visual Interfaces (AVI '16). ACM, New York, NY, USA, 280–287.

- [9] James E Cutting. 2016. The Evolution of Pace in Popular Movies. *Cognitive Research: Principles and Implications* 1, 1 (2016), 1–21.
  [10] James E Cutting, Kaitlin L Brunick, and Jordan E DeLong. 2011. How Act Structure
- [10] James E Cutting, Kaitlin L Brunick, and Jordan E DeLong. 2011. How Act Structure Sculpts Shot Lengths and Shot Transitions in Hollywood Film. *Projections* 5, 1 (2011), 1–16.
- [11] D4U. 2020. Motion Design: 20 Inspiring Animated Illustrations. https:// design4users.com/motion-design-20-inspiring-animated-illustrations/. Accessed:2021.
- [12] Google Doodle. 2015. Lunar New Year 2015. https://www.google.com/doodles/ lunar-new-year-2015. Accessed:2021.
- [13] Sonja K Foss. 2005. Theory of Visual Rhetoric. Handbook of Visual Communication: Theory, Methods, and Media 141, 9 (2005), 152.
- [14] Chris Harrison, Gary Hsieh, Karl DD Willis, Jodi Forlizzi, and Scott E Hudson. 2011. Kineticons: Using Iconographic Motion in Graphical User Interface Design. In Proceedings of the 2011 CHI Conference on Human Factors in Computing Systems (CHI '11). ACM, New York, NY, USA, 1999–2008.
- [15] IDEO. 2003. Method Cards. https://www.ideo.com/post/method-cards. Accessed:2021.
- [16] Jialun" Aaron" Jiang, Casey Fiesler, and Jed R Brubaker. 2018. 'The Perfect One' Understanding Communication Practices and Challenges with Animated GIFs. In Proceedings of the ACM on Human-Computer Interaction 2, CSCW (2018), 1–20.
- [17] Rubaiat Habib Kazi, Fanny Chevalier, Tovi Grossman, and George Fitzmaurice. 2014. Kitty: Sketching Dynamic and Interactive Illustrations. In Proceedings of the ACM on User Interface Software and Technology (UIST '14). ACM, New York, NY, USA, 395–405.
- [18] Rubaiat Habib Kazi, Fanny Chevalier, Tovi Grossman, Shengdong Zhao, and George Fitzmaurice. 2014. Draco: Bringing Life to Illustrations with Kinetic Textures. In Proceedings of the 2014 CHI Conference on Human Factors in Computing Systems (CHI '14). ACM, New York, NY, USA, 351–360.
- [19] Rubaiat Habib Kazi, Tovi Grossman, Nobuyuki Umetani, and George Fitzmaurice. 2016. Motion Amplifiers: Sketching Dynamic Illustrations Using the Principles of 2D Animation. In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16). ACM, New York, NY, USA, 4599–4609.
- [20] John Lasseter. 1987. Principles of Traditional Animation Applied to 3D Computer Animation. In Proceedings of the 14th Annual Conference on Computer Graphics and Interactive Techniques (SIGGRAPH '87). ACM, New York, NY, USA, 35–44.
- [21] Arnold M Lund. 2001. Measuring Usability with the Use Questionnaire12. Usability Interface 8, 2 (2001), 3–6.
- [22] Alan Male. 2017. Illustration: A Theoretical and Contextual Perspective. Bloomsbury Publishing, New York, NY, USA.
- [23] Richard E Mayer and Roxana Moreno. 2002. Animation as an Aid to Multimedia Learning. Educational Psychology Review 14, 1 (2002), 87–99.
- [24] Scott McCloud. 2011. Making Comics. Harper Collins, New York, NY, USA.
- [25] Sean McKenna, N Henry Riche, Bongshin Lee, Jeremy Boy, and Miriah Meyer. 2017. Visual Narrative Flow: Exploring Factors Shaping Data Visualization Story Reading Experiences. *Computer Graphics Forum* 36, 3 (2017), 377–387.
- [26] Ok-Choon Park and Reginald Hopkins. 1992. Instructional Conditions for Using Dynamic Visual Displays: A Review. Instructional Science 21, 6 (1992), 427–449.
- [27] Edward Segel and Jeffrey Heer. 2010. Narrative Visualization: Telling Stories with Data. *IEEE Transactions on Visualization and Computer Graphics* 16, 6 (2010), 1139–1148.
- [28] Yang Shi, Xin Yan, Xiaojuan Ma, Yongqi Lou, and Nan Cao. 2018. Designing Emotional Expressions of Conversational States for Voice Assistants: Modality and Engagement. In Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems (CHI EA '18). ACM, New York, NY, USA, 1–6.
- [29] Xinhuan Shu, Aoyu Wu, Junxiu Tang, Benjamin Bach, Yingcai Wu, and Huamin Qu. 2020. What Makes a Data-GIF Understandable? *IEEE Transactions on Visualization and Computer Graphics* Preprint (2020), 1–11.
- [30] Robert Spadoni. 2020. What is Film Atmosphere? Quarterly Review of Film and Video 37, 1 (2020), 48-75.
- [31] Qingkun Su, Xue Bai, Hongbo Fu, Chiew-Lan Tai, and Jue Wang. 2018. Live Sketch: Video-Driven Dynamic Deformation of Static Drawings. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI '18). ACM, New York, NY, USA, 1-12.
- [32] Frank Thomas, Ollie Johnston, and Frank Thomas. 1995. The Illusion of Life: Disney Animation. Hyperion New York, New York, NY, USA.
- [33] Chris Webster. 2005. Animation: The Mechanics of Motion. Taylor & Francis, Milton Park, Oxford, UK.
- [34] Olivia When. 2016. Leap Year 2016. https://www.google.com/doodles/leap-year-2016. Accessed:2021.
- [35] Harold Whitaker and John Halas. 2013. Timing for Animation. CRC Press, Boca Raton, FL, USA.