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Framing In Computational Creativity – A Survey And Taxonomy

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Abstract

The notion of framing computationally created artefacts - by providing a narrative context for the actions and motivations of the software - is an important part of building computationally creative software. In this paper we provide the first survey of framing in computational creativity; we provide a taxonomy of framing elements, covering motivation, implementation and rendering; and we look at future directions for framing, as well as its importance for the field's future.

Introduction

The Marriage is a 2007 videogame designed by Rod Humble. A pink square and a blue square begin on a blank background, drifting slowly around the screen as coloured circles fall from the top. On the website which now hosts the game, Humble writes: 'This is a game that requires explanation. That statement is already an admission of failure.' Yet we understand that the impact of creative work can be amplified through context, whether something direct like the title of a work, or something indirect like the knowledge that Humble is married (Humble 2007).

In (Charnley, Pease, and Colton 2012) the authors propose that this kind of contextual information, which they call *framing*, is potentially as important for creative software as it is for people, if not more. Pointing out that '*for the most part, computer-generated creative artefacts are not taken seriously by experts in the domain in which the artefacts belong*', the authors suggest that by providing more insight into the motivations, processes and meaning behind creative work, software can overcome bias and improve the perception of both the work it produces, and of itself.

Many computationally creative systems employ something similar to what Charnley et. al would call framing. Although the term 'framing' does not always appear in the papers describing them, many systems presented at this conference contextualise their output with additional information. Since the original proposal of the idea, there has been little analysis of how the concept of framing has affected the computational creativity community, nor has there been an attempt to categorise different kinds of framing.

We survey here the past few years of computational creativity research to try and understand how widely this concept has been adopted by researchers, if at all. We then provide a detailed deconstruction of framing into several stages – from motivation, through engineering, to final rendering – with the aim of clarifying what framing is and how it can be built into software. Finally, we suggest future research directions for research into framing, and argue that framing is a vital part of this field's identity, and may be vital to the field's future growth and relevance.

The paper is organised as follows: in *Background* we discuss the history of framing, our aims, and survey the state of framing today; we then examine different aspects of framing in *Purposes of Framing*, *Information Sources for Framing*, *Algorithmic Affordances* and *Framing Devices*. Finally, we propose future avenues for research in *Future Research Directions*, and then summarise in *Conclusions*.

Background

(Colton, Charnley, and Pease 2011) proposes the FACE and IDEA models as formal ways of representing computationally creative systems. In the FACE model, a computationally creative system is said to perform *creative acts* which are described as a series of one or more *generative acts*. These acts are categorised into one of four types: **E**xpressions of concepts; **C**oncepts; **A**esthetic measures; and **F**raming.

The FACE model defines a concept as '*an executable program... which is capable of taking input and producing output*' and an expression of a concept as a single input/output pair for a given concept. An aesthetic is defined as a function which takes '*a (concept, expression) pair... and outputs a real value between 0 and infinity*'. Framing is defined as '*a piece of natural language text that is comprehensible by people, which refers to a non-empty subset of generative acts*'. Under the FACE model, a '*non-empty subset of generative acts*' means any of the four types of act described by FACE – concepts, expressions, aesthetics and framing information. More simply put, an act of framing can describe a program, the input to or output from that program, or other framing.

Later, in (Charnley, Pease, and Colton 2012), the authors return to the concept of framing specifically, exploring the equivalent of framing information in human creativity and using it to provide greater insight into how framing could manifest in computationally creative systems. The authors also propose a '*dually-creative approach to framing*' whereby computationally creative systems create the framing information at the same time as the creative work it refers to. This model of framing reflects how most, if not all, systems currently perform framing.

Our Aims And Definitions

We have found framing to be a very useful concept in the construction of computationally creative software, both as a tool for enhancing the audience's experience (Cook, Colton, and Pease 2012), and as a guiding principle behind the construction of systems. For example, the latest version of ANGELINA, a computationally creative game design system, was engineered with framing in mind, and many aspects of the system's software are designed specifically to support richer framing, as described in (Cook and Colton 2018).

The primary aim of this paper is to provide a deeper exploration of framing, and to break down different elements of the framing process into finer-grained detail. In particular, we aim to approach framing as a step-by-step act of system design, no different from designing any other part of a creative system. In doing so, we hope to shed more light on the process, provide new vocabulary for those who already use framing, and most importantly make the concept more accessible for those who have not encountered the idea before or who are unsure where to begin to experiment with framing in their own work. We hope to show that framing can fit into any project, and can begin with very simple subsystems that do not require excessive engineering.

Our approach steps through framing from the planning phase through to the final output. First, we begin by considering the *motivation* for framing, to determine the effect we intend to have on the audience. Secondly, we consider the *information sources* available to us to achieve the effect. We also here introduce the notion of *algorithmic affordances* to highlight how different AI techniques and software structure give rise to different opportunities for framing output from creative behaviour. Finally, we discuss how framing can *manifest* itself in the final output, and how different representations can achieve different goals. Throughout these sections we refer back to work surveyed over the last few years to use as examples to illustrate our model.

Through our research and attempts to build this taxonomy, we have found it useful to refine our definition of what is and is not framing. The original definition of framing in (Colton, Charnley, and Pease 2011) – '*a piece of natural language text... which refers to a non-empty subset of generative acts*' – is useful for the formal context it is proposed in. However when surveying real-world systems, as well as when thinking about the step-by-step process of designing a framing subsystem, we found some aspects of the definition to be too broad, and other aspects too constricting. Many examples of framing refer to things outside of the scope of a system's generative acts, for example, and many system behaviours which seem to be for the purpose of framing are not necessarily expressed through natural text.

In an attempt to solve this, for the purposes of this paper we use the following definition of framing. It is similar in spirit to the original definition, but untied from the language of the FACE model which makes it a little more informal. We do not intend for this to replace the original definition, rather to complement it and provide another lens through which to understand the concept.

> *'Framing' refers to anything (co-)created by software with the purpose of altering an audience or collaborator's perception of a creative work or its creator.*

This definition is broader in some ways: it does not refer to natural language, and the framing need not specifically reference a creative work directly[1]. In other ways it is more specific, in particular we shift the emphasis of framing away from an emphasis on creative acts, and onto the audience that is engaging with the work. This makes it easier to think about the goals of framing and how it achieves them.

An Overview Of Framing At ICCC

	2015	2016	2017	2018
Systems	16	20	16	16
Framing	5	2	0	5
Explicit	2	1	0	3

Table 1: A summary of ICCC papers surveyed.

Although the term 'computational creativity' is increasingly overloaded, the International Conference on Computational Creativity is the largest event focused on systems designed to exhibit behaviours associated with creativity, and represents a good cross-section of contemporary research, techniques and theories about the field. In order to understand how framing is currently used and perceived by researchers, we surveyed the last four years of submissions to the conference. The survey focused on papers which presented computationally creative systems, although they did not need to be classified as 'System Description' papers to be considered. We looked at whether the authors explicitly mention framing as a concept and whether the system engages in framing (regardless of whether or not the authors describe it as such). As an example of implicit framing, in (Scirea et al. 2015) the scientific paper the system used as inspiration for its lyrics is displayed alongside its output, which acts as framing material despite it not being described as such. We used the definition given in the previous section as our guide for the survey, and the results are shown in Table 1.

We found that although framing is adopted by certain research projects and groups consistently, the concept in general has not been widely adopted yet. There are possible mitigating factors, one of which is the recent surge in new members. In 2016, for example, nine of the twenty identified systems papers had first authors who had not presented work at the conference before. Framing is a concept that is likely to be unfamiliar to new ICCC participants. The closest related topic to framing in AI is explainable AI (Fox, Long, and Magazzeni 2017), which is an increasingly famous topic in the press, but fledgling as an academic area. Another possible factor is the popularity of blind Turing-style tests of creativity, where user surveys are conducted without telling

[1]Indeed, theoretically this definition allows for software framing work created by people. We leave this for a future conversation.

participants that computational creativity is the subject of study. This approach precludes certain kinds of framing information from being used, especially text-based framing which can often be clumsy or obviously machine-generated. A third possible factor is the increased interest in machine learning, particularly neural networks – in 2017, seven of the sixteen identified systems papers involve a neural network of some description. While neural networks do not preclude many kinds of framing, some more simple approaches to framing are harder. We explore the potential for framing neural network-driven systems later in the paper.

Purposes Of Framing

As we state in our earlier definition, acts of framing are defined in terms of the effect they are intended to have on the audience. In the original exploration of framing in (Colton, Charnley, and Pease 2011) the authors suggest four purposes for using framing information, as part of a formal expression of their FACE model for computational creativity:

- **Providing Context** – '*Putting [the generative acts] in some cultural or historical context*'. This can include the context of the system's own past work, artistic influences and inspiration drawn from the real world.
- **Describing Action** – '*Describing the processes underlying the generative acts*'. Making explicit what steps the system went through to produce a work.
- **Expressing Decisions** – '*Providing calculations about the concepts/expressions with respect to the aesthetic measures*'. These can be guided by a number of factors, including crowd-driven heuristics and randomness.
- **Obfuscation** – '*Obfuscating the creative process and/or the output produced, in order to increase the amount of interpretation required by audience members*'. This is a more unusual use of framing, and one which we have not yet seen in a computationally creative system (although some systems achieve this unintentionally).

Later on, in (Charnley, Pease, and Colton 2012) the authors describe the function of framing from a different perspective, in terms of answering the following questions: **why** did you do X; **how** did you do X; and **what did you mean** when you did X?

In an attempt to bring these two sets of purposes together, we propose the following categories of purpose for framing information. Rather than describe them in terms of questions, instead we describe them in terms of the impact they have on the audience, which makes it easier to reason about when designing a framing subsystem for a creative process. We also expand the above definitions to include more psychological uses of framing, such as to mislead the observer into a more generous interpretation of a work.

Clarification

Here, framing attempts to provide information that can help an observer reassess the work and engage more deeply with it, or answer questions about it. For example, explaining what sources the system used as input allows the viewer to reinterpret the work in the context of these sources, a topic raised in (Colton, Pease, and Ritchie 2001) and (Pease, Winterstein, and Colton 2001). The purpose of clarification is not to provide vital information, but to augment the experience with secondary information that adds value.

In The Painting Fool's poetry generation work described in (Colton, Goodwin, and Veale 2012), the system combines its poems with a short piece of framing information in a diptych. One example begins: '*It was generally a bad news day. I read a story in the Guardian entitled: "Thai police hunt second bomb plot suspect in Bangkok"*'. This information isn't required to interpret the poem, which has value in its structure, rhythm, choice of language and themes. But with this additional context the audience gain an opportunity to read deeper and understand why certain phrases appear.

Reassurance

Here framing attempts to confirm the intent of the system in producing the work. This is particularly useful for skeptical audiences, who may desire a secondary confirmation that something they have observed as thoughtful or creative was in fact intended by the system. Such reassurances can also have a compound effect on audiences, as this encouragement can lead to the system being given the benefit of the doubt in future interactions. This is a higher standard than we would normally hold many human creatives to, but this is not uncommon in Computational Creativity (Colton 2009).

As an example of framing for reassurance, (Cook and Colton 2014) describes the ANGELINA system designing 3D games including the selection of music, which was motivated by a combined textual and sentiment analysis, backed up by a tagged database of music. Many users were unsure whether the choice of music was intentional or the result of a random selection. By explaining how the music was chosen in the framing, the user is reassured that the music choices are intentional.

Uncertainty and Deception

Here framing attempts to inject ambiguity or uncertainty into the audience's interpretation of the work, in order to increase the effort required to understand it. This can also encompass framing which is entirely fabricated; that is, it describes processes or motivations that do not exist, in an attempt to encourage a more positive interpretation of the work. Although this has been positively discussed in the past by researchers as an avenue to explore, no computationally creative system we are aware of has deceptive framing built in. Not all obfuscation is deceptive, however, and often the aim of obfuscation is to increase enjoyment by making the understanding of the system and its work more challenging.

One example of obfuscation is The Painting Fool's live portraiture work, described in (Colton and Ventura 2014). Audience members can sit for The Painting Fool and act as a model, receiving a portrait in a certain style after a period of time, usually printed out live on-site. The Painting Fool's behaviour is driven by a background process reading news articles, which affects the kind of styles it selects and can even result in it refusing to paint a portrait at all. However, the system does not explicitly detail the reasons for its simulated mood in most cases, simply reporting a phrase such as 'I was in a positive mood' when displaying its final portrait. As a complement, in the case where the system refuses to paint a portrait due to a low simulated mood, it favours reassurance over obfuscation, explaining the reason for its negative decision and justifying it to avoid the audience interpreting it as randomness.

Mitigation of Criticism

Here framing pre-empts criticism of the work by showing that the system is aware of its shortcomings and is capable of identifying areas where it can improve. This is another kind of framing that is useful for skeptical or critical audiences, as a lack of self-awareness is a commonly perceived weakness of artificial intelligence. This type of framing takes advantage of the fact that many computationally creative systems have very rich evaluation functions, and uses them to identify areas where the system failed, instead of only focusing on where it succeeds.

The best example of this is described in (Colton and Ventura 2014) where The Painting Fool sets itself a goal image before starting a portrait, and then evaluates its final work against the original goal. The system can then frame its success or failure with reference to its goals. This demonstrates to the audience that the system is aware that it can improve its work. Even if the audience have other criticisms of the work the system does not reflect on, any acknowledgement from the system like this helps build an argument that the system is growing and developing.

Advocacy and Argumentation

The framing attempts to engage the audience in a dialogue in order to justify or explain a cause of action in the face of criticism, or to persuade or change the audience's opinion about the work. This is especially important in co-creative settings where the audience may be collaborating with the system on a creative work in progress. In such a scenario, the framing serves as a way not simply to explain the system's actions, but to advocate for it in the presence of alternatives, attempting to put forward a justification for why a particular creative work or action was correct or appropriate. Understanding not only how to do this, but when it is appropriate to do this, will become a vital skill for AI to possess as they transition from passive tools to active collaborators.

While we are not aware of any computationally creative systems which do this, argumentation is a well-established multi-disciplinary field of study within artificial intelligence. For instance, Walton et al. have identified over 100 everyday patterns of arguments used in a variety of contexts, each with associated critical questions that can be asked of the premises, conclusion, or relationship between them (Walton, Reed, and Macagno 2008). These have been used in AI contexts for automatically identifying arguments from natural language texts (e.g. (Lawrence and Reed 2016)). A hypoythetical concept blending system might follow Walton's argumentation scheme "argument from analogy" to argue that its proposed design for a new swimsuit is good, because the material is similar to the texture and composition of shark skin. The system might then anticipate that people may ask critical questions associated with the scheme, such as whether the properties of shark skin are indeed reflected in the new material, whether there are other relevant properties that shark skin has that the new material does not have, and whether sharks actually move through water in an efficient way. Follow-up arguments can be prepared to each anticipated critical question.

Argumentation is a complex purpose for framing, and is challenging not only technically but socially, too. The role of AI as something other than a passive assistant is not just a question of capability, but also of user acceptance, and the idea of AI that can convince someone of a course of action is controversial. Nevertheless, we believe computational creativity offers a rich space to experiment with these ideas and ask such questions, and is also one of the most challenging domains to apply the ideas in, while also being ultimately a playful and safe one.

Information Sources For Framing

Recall that we generalise the aim of framing as being to augment or alter in some way the audience perception of a system or work. This process begins in the system itself, in the data and processes that make up the creative process the system performs: motivations, outputs, decisions, statistics. The sources available to a system will depend on how it is structured; what inputs and outputs it has; what medium it works in; what software and hardware are involved. Below we list some of the most commonly-used information sources and give examples of CC systems which use them.

- **Data Sources**: Describing knowledge bases or data corpora that were selected for use in the creative process. This can also provide insight into what influences or bias may be affecting a system. Example: ANGELINA cited newspaper articles that were parsed and used as inspiration for game designs (Cook, Colton, and Pease 2012).
- **Reasoning for Decisions**: Highlighting a (usually subjective) decision made by the system, and the data or process used to come to that decision. Example: PoeTry explains its selection of words in poetry by showing their relationship to the themes of the poem (Oliveira and Alves 2016).
- **Unused Outputs and Failures**: Showing work done that did not form part of the final artefact, either because of quality filtering or because it was further developed and superseded by other work. Example: The Painting Fool collects sketches of intermediate work that are later discarded (Colton et al. 2015).
- **Input Parameters**: Describing parameters or conditions supplied to the system before or during the creation of the work. Example: Sonancia tells the player what kind of tension narrative was requested, such as a 'cliffhanger' ending (Lopes, Liapis, and Yannakakis 2016).
- **Motivation**: Stating the intended aims or reasoning behind the work. These can be subjective goals, such as a stylistic aim, they can also be events which triggered creative activity such as a response to external stimuli. Example: The Painting Fool describes the goal it intended to achieve before it began work, as well as whether it feels it succeeded in doing so (Colton et al. 2015).

- **Internal Evaluation**: Using an internal evaluation function to demonstrate how the system evaluates some part of its process or finished work. This function is usually already integral to the system's inner workings, like a fitness function. Example: the artbots in Techne evaluate work in public and assign scores to them based on internal preferences (Pagnutti and Compton 2016).
- **Processes**: Explaining, in full or in part, the steps of a creative subprocess. This is often used to give a high-level overview of a system which is made up of many independent creative subprocesses. Example: ANGELINA steps through the game design process as it designs a game, commenting on each phase (Cook and Colton 2018).
- **Other Creative Systems**: Another creative system produces a work related to or inspired by the target work. This is usually a special case of an external data source. Example: (Gross et al. 2014) creates visual artworks inspired by the algorithmic process used to create a poem.

Algorithmic Affordances

The algorithms and resources we use to build computationally creative systems influence their shape and abilities, in both obvious and subtle ways. They necessitate a particular kind of input or output representation, they have individual weaknesses and strengths, they have biases that must be corrected for and gaps in ability that must be bridged. They also affect what opportunities we have for framing, by making certain kinds of information easier to access, or more interesting to comment on. Below we list several common components in computationally creative software, and discuss the particular affordances for framing they offer.

Computational Evolution Computational evolution is a popular technique in broader AI as well as within computational creativity. From a framing perspective it benefits from having a real-world analogue in biological evolution, which is a concept many people understand on a basic level, which aids in their perception of what the system is doing.

- **Internal Evaluation** An evolutionary system's objective function describes a particular goal it is aiming for, which can be used to describe how and why the system made changes to its population, why it rejected particular outputs, or why it accepted the final result. Its broader traversal of the fitness landscape can also be framed as meta-level creativity (Buchanan 2001).
- **Unused Outputs and Failures** Evolutionary systems consider and discard many outputs across populations before reaching a final output. An evolutionary system can retain these, even looking for large jumps in fitness or a shift away from local maxima to highlight its progress.
- **Input Parameters** While the specific parameters of an evolutionary system are probably not interesting to most observers, the general parameterisation (many or few generations, large or small populations) may provide context for how the system evolves output.

Neural Networks Training neural networks is an increasingly popular technique in computational creativity, and a wide variety of approaches fall under the umbrella term. General audiences are increasingly familiar with the term, although there are many preconceptions and misunderstandings that come with this familiarity.

- **Data Sources** If the system is trained on a particular set of data, either in a supervised or unsupervised fashion, this can help contextualise the system's behaviour. Facts like what data was used or how the data was processed can be used. Relevant individual data points from the training set can also be highlighted – for example, citing training data similar to a work as evidence of inspiration.
- **Internal Evaluation** While explicitly describing how a network's evaluation works is often impractical, neural networks offer a powerful opportunity for interactive framing with a user, by allowing them to provide inputs to a network and receive an evaluation in response.
- **Unused Outputs and Failures** Trained neural networks can show the system's growth over time, by retaining older or in-training versions of a network to compare. Neural networks have also been used to (deceptively) frame generation from their latent space as 'imagination', 'hallucination', or 'dreaming' (Karras et al. 2017).

Expert Systems & Knowledge Bases Expert systems, as well as systems that draw from large corpora of structured data, are effective tools for various creative domains, particularly language. Due to their use of large, rich datasets, they offer many opportunities for framing, and some expert systems are already designed with communication in mind.

- **Reasoning For Decisions** Such systems are designed to draw on domain models, knowledge bases and other stores of labelled structured data. Often this data has clear labels and sources attached, which enables the system to reference and explain the reasoning behind its choices.
- **Data Sources** In addition to explaining specific decisions, such a system can also discuss the exact origins of its knowledge and how that may impact the creative work that it performs. Knowing where data originates from and how it influences the system provides vital context.
- **Processes** Many expert systems use specific reasoning techniques like abduction to draw conclusions from their data. These reasoning processes can often be explained or paraphrased in plain English, which can help audiences follow the creative process.

Framing Devices

Below we identify several different approaches to framing creative work. This is not intended to be an exhaustive list, and we expect to see innovation in this area in the future.

Standalone Accompaniment Framing information that is read or otherwise consumed before, after or during interaction with a finished creative work, inspired by the panels of text that appear on walls next to artworks in galleries and museums. This is suited to precise textual output, and usually written as a non-fiction, extra-canon work in the third (or sometimes first) person. However, other renderings are possible, such as (Horn et al. 2015) which pairs the images which inspired its creation with the finished work.

Storytelling The work and its creation is told through a story, which may be fictional in whole or part. Stories would normally presented in the same form as standalone text, but the intent is to provide an entertaining narrative which enhances the presentation of the work and its creator, with embellishment, exaggeration and post-hoc rationalisation.

Visual Analogy Framing information that is designed to approximate or convey the spirit of a system's actions in a way that is easier to understand or interpret. For example, The Painting Fool uses a floating arm to highlight each brush stroke it makes during portraiture (Colton and Ventura 2014). This makes it easier to see where new strokes are being added, which elevates and visualises the specific way in which the software is painting such that the audience is more easily able to follow it.

Diegetic Framing information that is embedded in the fiction of the work. For some kinds of creative act, the justification of creative decision-making takes place within the context of the creative act's presentation or performance, and thus it is hard to draw the line between the act itself and the framing of it. In (Mueller, Coman, and Mayer 2018) the authors describe a hypothetical customer service AI that is capable of explaining the steps it took to meet a person's needs. Its justification is given in-character as part of the service dialogue, rather than being a separate artefact.

Audience Dialogue Framing information that is provided through a communication between an observer and the system. The dialogue may be limited in some way to allow the system to understand requests, but the observer is able to make more specific requests for additional information. (Cook and Colton 2018) describes a prototype dialogue system in which audiences can watch ANGELINA design games live, and ask simple parameterised questions to gain more information about the game currently being designed.

Argument Similar to dialogue, framing information is provided through a structured justification or debate. Rather than a question and answer session, as with a traditional audience dialogue, argumentation takes the form of active discourse, possibly during the creative act itself and in conjunction with other collaborators. Argumentation should not be thought of as a simple written dialogue, but a more complex exchange of information which may take written form or may take the form of other creative acts. For example, a writer working with a linguistic creativity system to create the opening line to a novel will not only argue about a line verbally, but will also alter the line, create alternatives, illustrate its point with examples. Argumentation is richer than dialogue in some ways, and closer to the creative act itself.

Future Research Directions

In this section we identify a few important issues yet to be fully explored within framing and explain what significance they have for Computational Creativity research in general.

Does Deception Work?

Deceiving people about the ability or autonomy of an AI system is not new (Weizenbaum 1966). In recent years there have been many examples of AI systems that have been misrepresented, from minor uses of questionable language like DeepMind's description of agents with 'imagination' (Weber et al. 2017), to more significantly misleading announcements such as Facebook's AI assistant, 'M', which was revealed to rely on human labour (Kantrowitz 2018). New companies in particular seem willing to make extreme claims as a PR effort, only to be met with a backlash later. For example, in 2018 a company called Predictim advertised a product that could vet babysitters using AI. They said they trained their AI 'to be completely ethical and not biased. We made sure... [it] can understand sarcasm or jokes.' A cursory investigation showed this to be false (Merchant 2018).

While it's clear that people are unhappy with being misled over the ability or functionality of an AI, we are unaware of studies into exactly how deception impacts the perception of an AI, and how people respond to discovering the truth later on. Computational creativity seems like a productive area to explore these ideas in, as our systems typically work in lower-stakes domains than systems applied to medicine or law. Exploring how deceptive or fictional framing can shape people's perception of a system and its work will greatly help us understand how audiences perceive creative software, as well as AI more generally.

The Artist Is Present

Most of the framing examples in this paper are static, where framing information is designed beforehand to be consumed alongside or simultaneously with a creative work. However, (Charnley, Pease, and Colton 2012) notes that '*[framing] might form an interactive dialogue*' in which questions could be posed directly to a system to obtain more specific answers about a work. Interactive framing poses many new challenges for computational creativity, but would enable audiences to directly engage with a work and to appreciate the system as a separate entity, surfacing the part of the system that (Cook and Colton 2018) calls *Presence* .

Interactive dialogue as a framing device also opens up the possibility that framing can change over time. The framing methods outlined in this paper are created alongside the piece and thus represent the system's view of the work at the moment of creation. An interactive system that responds dynamically could be completely distinct from the work itself, and instead connect directly to the current version of the creative software. This would allow the software to give a different assessment of its older works as it grows and develops its opinions and skills. This provides a kind of meta-framing opportunity, in which it not only demonstrates its ability to explain its work, but it also demonstrates that this understanding can change over time, and that the system is more than just the work it creates.

Critics And Curators

Our alternative definition of framing says that systems frame 'a creative work or its creator'. This does not require that the framing system is the creator of the work being framed. Further research is needed into the notion of computational curators and critics such as DARCI (Heath and Ventura 2016) - programs which can analyse, assess, critique and curate the works of other systems, and thus provide framing information for them. Such systems can also place the work in the cultural and historical context not just of human contributions to the medium, but of other creative software.

We believe the role of curation systems in particular could have a large impact on strengthening the field as well as preserving and enhancing its history and culture. Many computationally creative systems are considered in isolation, and even their works are not subjected to the kind of historical analysis that an artist's body of work would be. By considering the field as a whole, we can see how systems grow and how they (and their related research) influence one another. Many computationally creative systems are no longer active, some original works have been lost, and our record of them through written papers is incomplete. Building systems which can contribute to the preservation, analysis and understanding of our field is both thematically appropriate and a valuable avenue of research.

Framing-First Systems

The focus of this paper has been on creative systems which frame either as their sole function (e.g. critics) or secondary to creative work. However, systems exist whose framing is the primary output, and the main attraction for audiences, with the creative work merely providing a reason for framing to take place. For example, (Charnley, Colton, and Llano 2014) is a system which creates generative processes, the output of which are often very simple, but the framing of which is much more entertaining and interesting.

Framing-first systems provide us with a great opportunity to do in-depth research on framing. They are also appealing to audiences who are interested in the AI systems behind creative work, which is a crucial audience for our research already. Developing the notion of framing-first systems is a good way to nurture more research into framing and make it a central pillar of computational creativity research.

Conclusions

Computational creativity has a healthy and stable population of researchers, with new PhD students entering the field and a mix of technical and philosophical contributions presented at the main conference. However, in the broader context of 'Creative AI', Computational Creativity as we define it (Colton and Wiggins 2012) has not seen the same kind of meteoric growth that other venues and subfields have. Machine Learning For Creativity And Design, a workshop at NeurIPS, had an audience of over 200 in 2018. We must ask ourselves why our field has not become a larger part of the conversation about creativity and AI, and why these communities are not submitting to our conference more regularly.

We argue that we can no longer distinguish ourselves as a community simply by focusing on building software that creates. While we celebrate and acknowledge new experimentation along these lines, Computational Creativity as a field needs a stronger identity in the current era of research and practical work in creativity and AI. Years of clamouring about 'mere generation' have let us avoid interrogating the aims of our field and what we can contribute to the discourse about creative software. We believe that framing represents something unique and focused, that embodies the goals of the field as defined in (Colton and Wiggins 2012):

> *The philosophy, science and engineering of computational systems which, by taking on particular responsibilities, exhibit behaviours that unbiased observers would deem to be creative.*

Our alternative definition of framing explicitly talks about how we build a connection between our systems and the unbiased observers that judge their work. Framing is a positive contribution that we can make to the broader field of AI, that doesn't diminish or devalue existing work on creative and generative AI, and that has a concrete structure as outlined in this paper that we can build on, discuss and expand.

This is not to say that every researcher reading this should down tools and immediately begin to work on framing. Rather, it is an invitation to join us in exploring these ideas, to help normalise this as part of the engineering praxis of Computational Creativity, and to help expand and develop the theory behind it so we can show the usefulness of this approach to communities beyond this one, and rediscover our place in the now rapidly-changing world of creative AI.

As we mark the tenth year of ICCC, it is useful to reflect not just on how research has developed over that decade, but how the public perception of and relationship with AI has changed. Today the public encounters AI, or things purporting to be AI, on a much more regular basis. They must frequently interpret descriptions of these systems which are exaggerated, embellished or misleading. Studying, understanding and improving the way systems explain and justify themselves can change this relationship for the better.

In this paper, we decomposed the idea of framing information into three facets: *sources* of information, which framing information draws from and relies upon; *purposes* for framing, the exact impact on the audience the framing seeks to achieve; and *means* of framing, the way in which framing is presented to the audience. We showed examples of existing work demonstrating these ideas, as well as pointing to ideas which have yet to be fully explored. We also discussed the notion of *algorithmic affordances*, encouraging us to think about how the shape of our software also shapes, in turn, what the system can and cannot explain about itself.

Framing is still not a widely adopted concept within Computational Creativity, but we hope this paper both clarifies the existing work that has been done, as well as broadening and strengthening the notion of framing so that researchers feel more confident in applying it to their own work.

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