# *Fantibles*: Capturing Cricket Fan's Story in 3D

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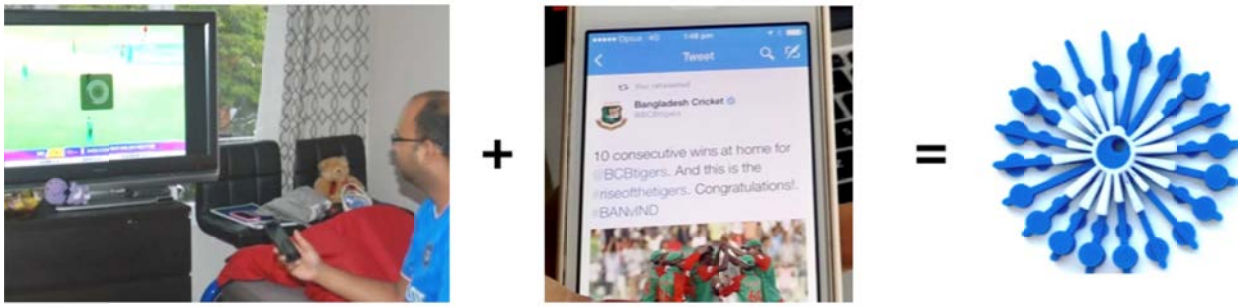


**Figure 1: Watching cricket on TV and simultaneously discussing it on Twitter, create a story that we 3D print as *Fantibles*.**

## ABSTRACT
Sports fans are increasingly using social media platforms like Twitter to express emotions and share their opinions while watching sports on TV. These commentaries describe a intense subjective experience of a fan watching a sport passionately. We see an opportunity to attend to these nostalgic moments by capturing them into a physical form. We present, *Fantibles*, personalized sports memorabilia that highlights an individual's commentary about sports on Twitter along with the uniqueness of each sports match. As a first case study, we investigate *Fantibles* for one popular sport, Cricket. We report insights from field deployments of *Fantibles* during an ODI Cricket match series between India and Bangladesh and offer reflections on the design in the form of four themes: self-expression, layered sense making, ad-hoc interactions and distributed social interactions. We believe our work opens up new interaction possibilities to support social sports viewing experience and design thinking on creating personalized sports memorabilia.

### Author Keywords
Sports souvenirs; cricket; social media; 3D printing; physical visualization.

### ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.


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## INTRODUCTION
Rahul is a big cricket fan and today he is watching a cricket match between India and Bangladesh on TV. Being a true supporter of his national team, he is all dressed up in the Indian team jersey (see Figure 1.a). As the match is unfolding, Rahul is getting excited and emotional on his team's performance. He is cheering for every '6' scored and every wicket taken by his team. But he is also feeling sad to miss out on the experience of 'being there in the crowd' where everyone is chanting, cheering and having fun together. Now to feel connected with other co-spectators of the same match, he starts tweeting his opinions and emotions about the match (see Figure 1.b).

The above scenario illustrates a typical example of home viewing of a cricket match within the Asia-pacific region where Cricket has a devoted fan following [8,45]. Such cricket fans show incredible passion towards their favorite team and relate to their team's performance as their own success or failure [19,47]. However, unlike stadium viewing, home viewing does not offer easy ways to keep the sports related memories alive. For example, stadium viewers often bring back tangible memorabilia like match tickets, selfies, video clips of the match that allow them to reminiscence and proudly display their passion towards sports afterwards. At home, such memorabilia are not readily available, although fans can go re-read the twitter comments or watch the repeat telecast of the match, we find that it does not offer the same level of affordance as tangible sports memorabilia would. As such, the home viewing might become an ephemeral experience that slowly fades away from the fans' memory.

This paper explores an opportunity to enrich home viewing experience of sport by attending to passionate moments during home viewing a sport, as expressed by the fans in their twitter feed. We further believe that an individual's

sports commentaries on Twitter if captured and summarized in a tangible form could provide a subjective understanding of the sports from the perspective of a sports fan. Additionally, the constructed artifact could also serve as a memorabilia, allowing individuals to show their passion and to reflect on their memory of the sporting event. Motivated by this idea and recent advancements in 3D printing technologies, we put forward a concept of personalized memorabilia, which we call *Fantibles* (refer to Figure 2).

*Fantibles* stand for fan made collectibles, whose design is influenced by not only the sporting event but also by the fan's reactions to it. *Fantibles* has two interlocking 3D printed parts. The first part is *Fantoms* that illustrates excitement levels of a sports fan during a sporting event. The second part is *Sportoms* that describes the crucial data from the sporting event in a chronological circular form. As such, the *Sportoms* provides the context for the excitements expressed in *Fantoms*.


**Figure 2: *Fantibles* created from the individuals' Twitter data during the India vs. Bangladesh Cricket series. The color of the *Fantibles* resembles the color of the winning team's jersey.**

In this paper, we exemplify the idea of *Fantibles* with TV viewing of one popular sport, Cricket, which has so far received little attention in interaction design and HCI. We report insights from an "in the wild" study that investigates how the design of *Fantibles* could affect an individual's relationship with the sports. We recruited 6 study participants during an International three match cricket series between India and Bangladesh. The duration of each match was 8 hours. Participants continued their practice of tweeting while watching the match for all three matches. After each match, they received 3D printed *Fantibles* that were personalized to their tweets and the corresponding cricket match. At the end of three match series, we conducted semi-structured interviews to obtain qualitative data about their experiences with *Fantibles*.

Our work makes the following contributions: 1) We explore and study the concept of *Fantibles* to enhance the home viewing experience of Cricket fans. To this end, this work contributes to the understanding of the relationship between sports memorabilia, social media and sports viewing at home. 2) We contribute to the field of physical visualization [23] by illustrating an approach of representing two different sets of information together. While Sportoms and Fantoms carry individual meaning, interlocking the models illustrates the correlation of user excitement with respect to the game in a novel tangible way. 3) Finally, based on the insights gained from the study, we propose a set of four themes to guide designers for extending *Fantibles* to other sports.

## RELATED WORK

As this work delves into three related topics - sports, social media and memorabilia - we have categorized the existing works accordingly. We start by describing the influential role of technology in today's sports.

### Interactive systems enhancing the sports viewing experience

In sports, technology is often rated as a game changer as it facilitates means to deepen the involvement in sports and provides different ways to better understand the sport. Companies like Hawk-Eye [21], and SportVision [42] provide enhanced TV viewing experience using virtual animated overlays on live broadcast of sporting events. SlamTracker [41] provides fans with a visual representation of a match using scores and statistics. Sports stadiums are also increasingly making use of larger displays to show additional information about the ongoing match such as score updates, replays and close-up shots [7] while mobile apps have been built that support live video streaming, replays and statistical analysis [1].

Recent works have started to recognize the spectators' role in sports. For example, Tomitsch et al. [44] created a wireless motion-sensor wristband that detects applause and allows spectators to be judges of the performance, while Flintham et al. [13] created an android app that collects rich metadata from the spectators of a live marathon event. The SportsSense [51] is another system that reveals television spectators' emotions during a sport event in real time on TV, while Ludvigsen and Veerasawmy [31] created an interactive banner that displays noise and movements of sports fan in stadium. In summary, numerous works highlight the potential of interactive technology to support fans and to enhance the sports viewing experience. Drawing inspiration from these works, we present *Fantibles* that involve active participation from the home spectators in the creation of memorabilia, which to the best of our knowledge has not been explored yet.

### Importance of Sports Memorabilia

Sports memorabilia have a long history of reviving 'golden memories' associated with iconic sports events [11, 19, 20]. For example, many sports fans keep match tickets as a token for their memories associated with the match they witnessed in the stadium. Other popular sports memorabilia

items include team jerseys, signed picture frames, sports equipment, trophies and also things that fans associate with the sporting event such as match tickets and captured photographs from the event [20]. These memorabilia enable fans to remember enduring battles between the teams and how their support and cheering contributed to the winning outcome.

However, despite the demand of sports memorabilia [7,14], the current exploration on designing sports memorabilia is limited [49]. These memorabilia as found in sports heritage museums and endorsed merchandise offer a rather arbitrary view on the sports. For instance, most sports memorabilia embody a generic design that attain to objective facts and moments of historical significance such as victories, broken records and personal milestones [15,30,40]. However, their design does not fully capture the subjective experiences and emotional rollercoasters of witnessing a sports match. As a result, they miss out on being a true representative of the sporting event as it unfolded in time [30]. Connerton [6] further argues that momentous events like iconic sports matches are experienced and remembered differently by each individual fan. He calls such an experience 'private nostalgia' that originates from the personal memory of the event and is different from the 'collective nostalgia' of the event. Unfortunately, existing works around sports nostalgia rarely emphasize and discuss the private nostalgia of a fan, which we think is a missed opportunity. Frow [15] and Snyder [40] also fear that the commoditization of collective sports memory as observed in current memorabilia, incurs a danger of only the collective views becoming the dominant narrative of the social history of sports, which in turn could lead to loss of individual memories of the sporting event. The aim of this work is therefore to capture and support the private nostalgia in the design of sports memorabilia, which thankfully with today's technologies we are beginning to explore.

### Use of social media during sports events

The rise of social media allows fans to not only follow their favorite players and sports on social media but also to participate in conversation with like-minded fans [22, 36,38]. Twitter, for example, is often used as a backchannel to share and observe commentary and opinion about an ongoing TV sporting event [22], where the first screen is the television broadcast of the event while the second screen is a smartphone or a laptop used to monitor and express opinions about the event. In the past, the interaction between fan and athletes was mostly one-sided, where only the few fortunate fans getting an opportunity to interact with favorite athletes through the cursory of autograph signing [38]. Athletes and sports management authorities have also acknowledged the role of social media to create positive exposure among fans [38]. For example, Philadelphia Wings of the National Lacrosse League put players' Twitter handles on the backs of their jerseys [36]. Kim et al. [28] has done a comprehensive analysis of the tweets during the 2014 FIFA world cup in order to identify interesting patterns and linguistic features that prompted emotional response among sports fans on social media. Some works have also looked at creating novel visualizations to represent tweet data of the sports fans onscreen. For example, Kamvar and Harris [24] used different color particles to imitate emotions of fans on a common plane, while Kempter et al. [26] proposed an EmotionWatch, to display different categories of emotions. The majority of the existing explorations on visualizing individual's tweets are mainly onscreen, except for the work called Emoto [10], which got us thinking towards a tangible souvenir and its potential to support visualization of tweets. Emoto is a public art display that showcases tweet sentiments during the 2012 Olympic games.

### Research opportunity

Existing works highlight the importance of social media as a platform for fans to express their emotions and to feel closer to other fans and the game itself. If the role of social media is to support the dreams of fans to get closer to the sport, players and fans alike, the role of a souvenir is to preserve such special moments for the future. Thus, the overlap of social media and memorabilia can offer new opportunities of recreating memories by translating social media interactions and moments into a tangible form. Incorporating personal data into memorabilia can add a new layer of personality by expanding its context to social dimensions, and potentially could also serve as a visualization platform to get an abstract summary of the game. This research takes into account the current popularity of digital fabrication coupled with the existing knowledge of affordances of physical visualization [23, 27, 43], which makes fabrication of physical artifacts more accessible. By situating digital fabrication within the context of TV sports viewing experiences, this research also opens up an exciting new design space.

## DESIGNING *FANTIBLES*

*Fantibles* is a personalized sports memorabilia that embodies the subjective passionate experience of sports viewing in a tangible form. *Fantibles* capitalizes on the trajectory of the individual's tweets and the progression of the sports event in real time to create a unique 3D printed souvenir. As such, *Fantibles* utilizes two data sets: sports statistics and social media streams. The sports statistics include the essential information (or highlights) of a given sporting event, while the social media stream incorporates spectator engagement levels during the event. These two data sets are transformed into separate 3D printed models: *Sportoms* and *Fantoms* that interlock with each other. Before describing these models, we first explain the rationale behind some of our design decisions.

### Choosing Cricket

We choose Cricket because of its wide popularity in the Asia Pacific region with a huge fan base on social media platforms [8,45]. For instance, a recent survey [45] indicated that 89% of Twitter users in India are cricket fans. In the current prototype, we opted for the One Day

International (ODI) version of cricket as it was scheduled around the study time. An ODI match roughly lasts for 8 hours and has 100 overs in total where each team plays 50 overs. Explaining the entire rules of Cricket are beyond the scope of this paper, instead we only narrate the key aspects of Cricket that we incorporated in the design of *Fantibles*.

Cricket is a game played on a large field with a bat and ball between two teams, each with 11 players. Each team takes turns to bat in order to score runs, while the other team bowls. The first team to bat, scores runs and sets a target for the bowling team to achieve. The other team then tries to achieve this target when they bat. A cricket match is of multiple overs with each over having 6 ball deliveries. A player, while batting, can score runs by hitting the ball with his bat in the field. If the ball crosses the boundary line of the field then the player gets '4 runs'; And if the ball crosses the boundary line aerially (i.e., without touching the field before the boundary line), then the player is rewarded with '6 runs'. Players from the bowling team can stop the batting team from scoring runs by bowling good deliveries that are difficult to hit and by preventing the ball from crossing the boundary line. Additionally, the bowling team can also get the player out, which is called as taking a 'wicket' by following the predefined set of rules (e.g., catching the ball before it touches the field). These runs scored in 4's and 6's as well as taken wickets are crucial and exciting parts of the Cricket game. Hence we have incorporated them in our design.

### Capturing User Excitement

The idea of user excitement has always been central to the sports. Loy refers to sports as "intrinsically appealing" and suggests that the feature of "problematic outcomes" in sports "lends tension and excitement to the sporting contest" [30]. The uncertainties in the sporting event create tension and in turn excitement among the spectators. We thought of different ways of capturing user excitement during a Cricket match. For instance, one option was to capture user's heart rate or galvanic skin response during the game using wearable devices. However, such a setup could have hindered the privacy and natural sports viewing experience. Hence, we opted for a less obstructive way of capturing user excitement, through an individual's emotional outbursts on Twitter during a Cricket match. Since tweets are publicly visible by default, their usage is not heavily loaded with privacy related issues.

### Giving physical shape to data

After selecting the data sets: cricket data and tweets, the next challenge was to turn these two data sets into a meaningful visualization that communicates the dynamics of and emotions around a sporting event. The design process involved careful examination of data sources for selecting game statistics and integrating personal data, coding, prototyping and testing the viability of the design for 3D printing. Since we embarked to create a tangible representation of sports and tweets data, there was also a tension in terms of how much information should be conveyed in a tangible form. Figure 3 illustrates some of the earlier design sketches. We discarded these designs because of the involved lengthy modeling and printing processes. Additionally, these designs were representing multiple sets of information into one model, which in turn was making the model complex to interpret.

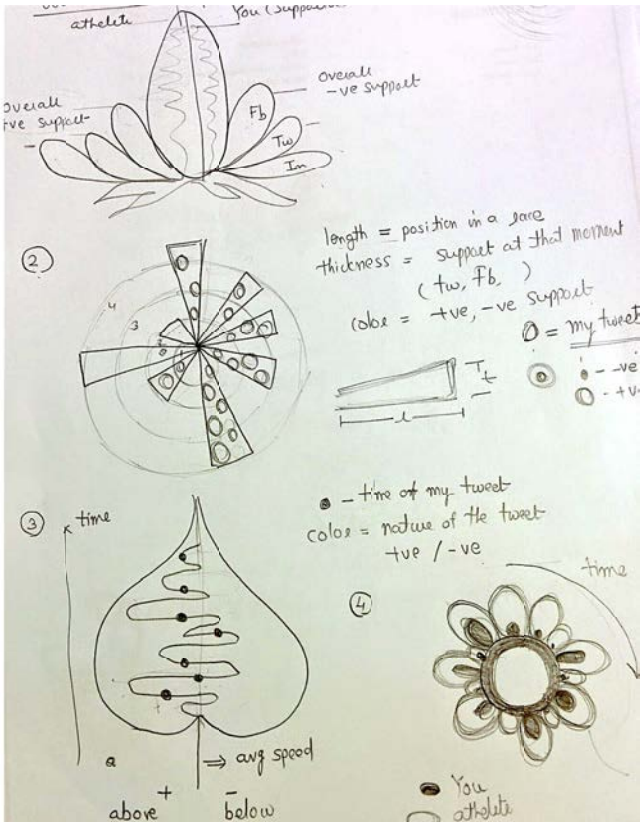


**Figure 3: Earlier design sketches for *Fantibles***

As a result, instead of trying to fit all pieces of information onto one model, we decided to create two interlocking models, building upon earlier work by Nissen et al. [35]. The first model represents the sports data while the second one describes the fan's emotions through tweets. These models individually provide information about the embedded data such as sports and tweets but when joined together reveal additional information such as the relationship between the two. Additionally, the models are 3D printed using the color of the winning team's jersey as shown in Figure 2. For example, if India won the match, the two models were printed in White and Blue colors (colors of Indian Cricket team's jersey), whereas if Bangladesh won the match then the models were printed in red and green. Below we describe the final design of the two models.

### SPORTOMS

The name *Sportoms* stands for Sports Atoms, which represents sports data in a tangible form. Here, we focus on the key moments of a sporting event that cause excitement

among spectators and thus may result in generating ample tweets. With *Sportoms*, we utilize the data about the competition between the two playing teams in terms of the runs scored in 4's and 6's and the wickets taken at any given time. We borrow inspiration from a popular Wagon Wheel [12] model to represent this information in a chronological order because of its simplicity in representing large amount of information. As such, the *Sportoms* serves as a timeline and consists of 20 bars distributed evenly around a central cylinder as shown in Figure 4. These 20 bars summarize 100 overs of an ODI cricket match where each bar represents the time duration of 5 overs (on average 8 minutes of gameplay).

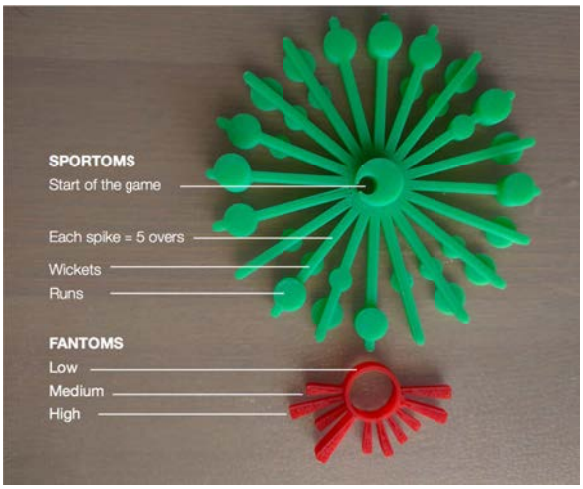


**Figure 4: *Fantibles* consists of two interlocking 3D printed parts - Sportoms that summarizes sports data, and Fantoms that represents user excitement.**

The spike with a small hole denotes the starting 5 overs of the match and the clockwise reading of the *Sportoms* describes the progress of the match in 5 overs. Each spike has two cylinders of different widths placed next to each other. The outer bigger cylinder (width: 4mm) denotes the runs scored by the batting team while the inner smaller cylinder (width: 3mm) describes the wickets taken by the bowling team during the corresponding 5 overs of the match. Every '4', '6' or 'wicket' would result in an increment in the height of the corresponding cylinder by 1mm. This chronological mapping of the information allows for easy comparison between the two teams in terms of the runs and wickets, which also highlights the dominance of one team over the other.

## FANTOMS

The name *Fantoms* stands for Fan Atoms as it represents data from fans (their tweets) in a tangible form. *Fantoms* summarizes varied levels of excitement of sports fans during the live broadcast of a sporting event, analyzed from their tweets. In the current prototype, the analysis is done manually in the following way.

We parse all the tweets posted by an individual across every 5 overs of a cricket match and then categorize these tweets into three levels of excitement: low, medium and high. If the user has not tweeted during a given interval of 5 overs, then we consider their excitement level during that period as 'low'. However, if the user has posted a tweet, then we consider it as a rise in the excitement level of the user. We manually parse each tweets to identify emotional outbursts outbursts such as occurrence of words such as 'OMG!', 'wow!' or the use of emoticons that illustrate a rise in excitement level. The absence of excitement in the tweet signifies 'medium' level of excitement. Note that these excitements can correspond to both positive and negative emotions. In the current design of *Fantoms*, we did not consider positive and negative moments separately because - irrespective of the polarity - these emotions are integral parts of the sports viewing experience.

The *Fantoms* embodies a floral pattern where each petal of this model describes the changes in user excitement for every interval of 5 overs (Refer Figure 4). The length of each petal describes the user excitement levels. For instance, a petal of 0mm length describes a 'low' level of excitement, while a petal of '10mm' length and '20mm' length describes the 'medium' and 'high' level of excitement. Additionally, the height of each petal is used to denote the frequency of tweets during the given period of 5 overs. Therefore, each subsequent tweet within the given 5 overs will raise the height of the corresponding petal by 1mm. The *Fantoms* is read clockwise starting from the petal containing a small bubble on one of its end. However, unlike *Sportoms*, *Fantoms* do not have a fixed number of petals, rather the petals are created based on the pattern of tweets. By placing the *Fantoms* on top of the *Sportoms*, one can easily identify the score and the chronology of excitement with respect to the sporting event.

## STUDYING *FANTIBLES* IN THE WILD

We conducted a qualitative field study, to investigate the use of *Fantibles* in everyday context. We deployed our system among participants in order to collect a rich set of subjective data and to gather ideas and strategies to future designs. We selected a major One-day International Cricket series, played between India and Bangladesh. The series had three matches that were played on the 18th, 21st and 24th of June 2015, each match accounting for more than 8 hours of TV viewing.

We recruited six participants by circulating a call for participation across different mailing lists (Refer Table 1). The participants were selected based on their interest in the India Vs. Bangladesh Cricket series and their willingness to share their experiences on Twitter. Additionally, we chose participants who could watch all three matches. The limited availability of 3D printing resources and the manual task overload prompted the study to be done with a small pool of participants: printing the *Sportoms* required an hour and *Fantoms* required 20 minutes to print. As such, for 6 participants per match, *Fantibles* required around 8 hours of daily printing for each match. Since the matches were on

every other day, we had limited time to print and distribute the *Fantibles* to each participant before the start of next match.

| Name* | Age (yrs.) | Gender | Nationality |
|---|---|---|---|
| Heather | 20 | Female | Canada |
| Samira | 26 | Female | Bangladesh |
| Nelson | 25 | Male | Bangladesh |
| Shahid | 28 | Male | Bangladesh |
| Rahul | 32 | Male | India |
| Dev | 30 | Male | India |

**Table 1: Participants' demographic details (*names changed).**

We designed a custom web-based system that extracts tweets from the official twitter account of the chosen Cricket series (@ICCLive) and the participants' twitter accounts. We manually parsed the participant's tweets to identify user excitement levels and the feed the levels back in to the system. The system then creates both the models from the match statistics coming from the tweets by @ICCLive account and identified user excitement levels (refer Figure 5). We used the Twitter API to fetch the tweets and utilized the constructive solid geometry techniques with OpenJSCAD [37] to construct the 3D models.

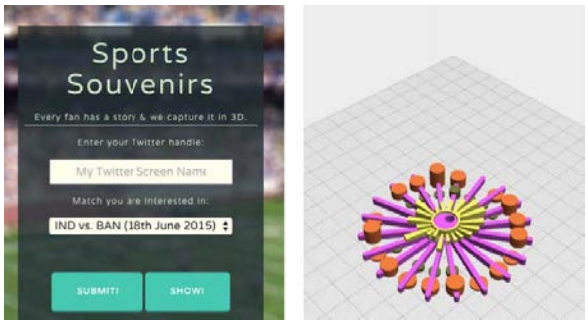


**Figure 5: Screenshot of the system: a) Users enter their twitter handle and then select a match from the Cricket series. b) A 3D model of *Fantibles* is then created based upon the sports data and users' own tweets during the match**

We asked each participant to continue their regular practice of tweeting during each of the three matches of the chosen Cricket series. Once the match was over, we accumulated all the tweets from every participant and created 3D models of *Fantibles*. We prepared an envelope for every participant where we put both the models in along with a paper note that contains a brief description about the models and a couple of questions asking participants' about their first hand experience with these models (Refer Figure 6). The envelope was then personally handed to participants in their home or workplace within 24 hours after the Cricket match. Participants were asked to answer the questions on the note itself and bring them to the interview. At the end of the cricket series, we conducted open-ended semi-structured interviews with participants to understand their experiences with *Fantibles* and how *Fantibles* helped them in reviving memories of the Cricket matches. Additionally, the written notes were used as probes to get more insights into participants' first hand experiences. Each interview lasted for around 45 minutes and was audio recorded and transcribed for analysis. We used thematic coding [5] to derive recurring themes from the collected data.

## REACTIONS TO *FANTIBLES*

The overall response from the participants was positive. Participants appreciated the novelty and playful nature of the *Fantibles* and compared it with their routine way of checking sports data on TV and tweets on a mobile screen.

### First impression was to keep the *Fantibles*

Heather expressed joy while opening her first envelope containing *Fantibles* (refer Figure 6), "*When I took it out of the package and everybody in my office looked over and they were like: 'what's that? It looks really cool and exciting'*." Shahid also expressed similar feelings, "*My first thought was it looks good, and I want to keep it*". Nelson on the other hand said, "*I would not personally bought the idea of sports memorabilia but these models made me rethink as they are very good representations of the game, I will definitely keep them*".

**Figure 6: *Fantibles* were hand-delivered to each participant in an envelope the next day of the concluded match.**

Samira and Shahid were similarly delighted to receive a tangible testimony for their loyal following of Bangladesh cricket. Samira said with a smile, "*It feels good to get your own trophy for being the biggest fan*". Out of enthusiasm, four participants voluntarily took and shared photos of their *Fantibles* on different social media networks such as Facebook and Instagram (Refer Figure 7).

**Figure 7: Participants enthusiastically posted photographs of their *Fantibles* on Instagram, Facebook and Twitter. (The text in the picture is blurred to preserve participant's anonymity.)**

### *Fantibles* became part of the home ambience

Participants decorated different areas of their home with *Fantibles* (Refer to Figure 8). Heather for example tied two of her *Fantibles* with a string together and hung her family pictures onto it (Figure 8d), while Rahul placed the *Fantibles* on his TV (Figure 8b). Dev and Samira glued small magnets to *Fantibles* and used them to decorate their fridge (Figure 8c).

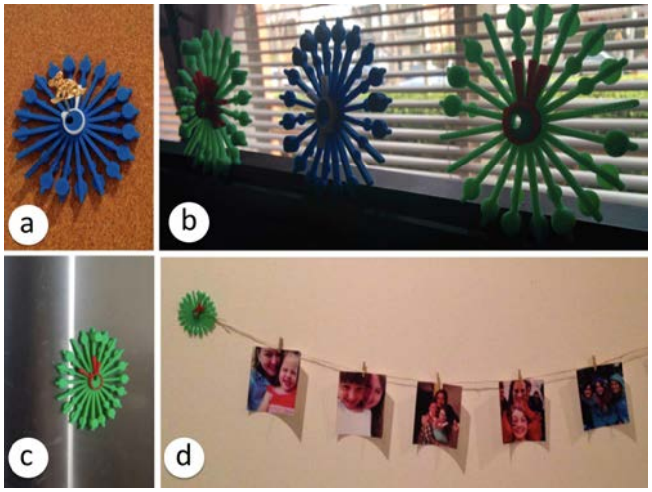


**Figure 8: Participants used the *Fantibles* in different places in their home.**

### Exploring *Fantibles* for information was fun

Participants correlated their understanding of the Cricket match with the received *Fantibles*. At first, understanding the *Fantibles* was difficult for them because of its unfamiliar abstract design; however, all participants treated this as a fun activity that tested their knowledge and memory about the cricket matches as well as their own tweets. Rahul said to us with a smile, "*It was difficult at first for me to understand what Fantibles conveys, but I liked the abstractness of it, which challenged my thinking. And the interesting part is, the more I understand the meaning, the more I want to keep it.*" However, five participants suggested improving certain parts of the design for clarity. For example, the use of thinner and thicker circles to represent wickets and runs respectively was confusing for the participants. Dev instead recommended, "*Using a different shape like a triangle or square would have been easier to interpret*".

### *Fantibles* provided a quick summary of the match

All participants liked the fact that *Fantibles* provides a nice summary of the entire match at a glance. Samira mentioned, "*When I miss some parts of the match, I usually ask my husband about what happened in the match in order to know who won and how. Sometimes I also check sports and news websites, but these sites offer too much of data. In order to know how the game went requires reading of an entire commentary page. I wished for something simpler and easy. The Fantibles give me a pretty good view about what happened. From the colors I know who won the match, by looking at the thickness I can say whether it was a high scoring match or low scoring match, it saves a lot of my time, definitely*".

### *Fantibles* made complex sports data simple to understand

Dev similarly was impressed by the new way of representing data in a tangible souvenir, "*I felt it is a very nice representation of the match. To me, Cricket has always been about graphs and statistics. I never came across to something like this where you can see how many runs were made through the match. When you hold them [models] in your hand, you can see over time how runs were made and how many wickets were taken.*"

### Physicality of *Fantibles* supported frequent engagement

Five participants liked the fact that with *Fantibles*, they did not have to open the computer and navigate through file structures in order to interact with sports and tweet data. Nelson mentioned to us, "*With the physical, you only keep what matters to you. With digital, there is no such limit, for example the entire match data would take 1 or 2 MB of space in the disk. I would probably copy my data onto the disk but would never look at it again. But with Fantibles, the data is in physical form now. I can now place my data on my desk and it will be there for ages and I am also sure I will interact with it once in awhile. If Fantibles were digital, exploring them would have felt like work*".

### Durability of *Fantibles* was desired

*Fantibles* were made up of a biodegradable material like PLA. Participants liked the use of plastic as it lasts over time - however they also raised the question of environmental sustainability. Plastic made the memorabilia durable and usable in everyday context. Rahul was impressed with the quality and found them quite alike with things he has bought from the shops. Dev on the other hand was glad that *Fantibles* does not wear and tear easily like some of his precious souvenirs do. For example, he showed us a slightly aged and torn Melbourne Cricket Ground (MCG) ticket, which he has bought five years back. He has kept it as a souvenir to remind him about his first match at the MCG. Heather and Samira wished if they could print

*Fantibles* in different metals like bronze, silver and gold, similar to medals given in spots tournaments.

#### ***Fantibles*** **in winning team color was appreciated**

All participants appreciated the fact that the *Fantibles* embodied the color of the winning team. Dev was surprised when he came to know about the colors, "*Initially, I did not think of the color choices. I thought they were random but I was positively taken aback by the use of winning colors*." However, Samira and Nelson wanted colors of both the teams reflected on the *Fantibles*. Nelson said, " *I don't know if it is possible, but it would be great to have half portion of Fantibles in one team's color and other half in another. In that way I can then easily see the battle between the two teams*."

#### **Tweets made** ***Fantibles*** **personal and unique**

All participants appreciated the use of personal data, their tweets during the match in the design, and considered it as a thoughtful addition. Nelson said, "*Tweets bring something new to the world of memorabilia and make them more personal*". Dev similarly expressed, "*because of the tweets, Fantibles felt more unique and personal to me*".

#### ***Fantibles*** **offered reflection on self**

Using Fantoms and Sportoms in relation to each other, Heather was delighted to learn about the things that excited her in the match most, "*Looking at this guy (a thicker circle that denotes runs), it is kind of cool to see, I am more excited for the runs. I never realized that*". On the other hand, Shahid said, "*Fantibles helped me in remembering good and bad memories of the match. I like to remember bad memories, I remembered the argument on Twitter I had with friends that whenever we win the match or series, we forget the mistakes we made. We discuss only the victories, but it is good to remember the mistakes and challenges that are still to be overcome*."

#### ***Fantibles*** **prompted tweeting**

After receiving the first set of *Fantibles*, participants came to realize how their excitements and tweets gets reflected in the floral design pattern of Fantoms. They realized that how they could alter its design by changing their tweeting behavior. As a consequence, four participants enthusiastically expressed their emotions in tweets in subsequent matches. Nelson mentioned, "*My first reaction after receiving the first Fantibles, was to tweet more and to see how it would turn out in the design*." He further added, "*Although after getting the second and third Fantibles, I was still excited and the design made much more sense*". Heather on the other hand was disappointed for not tweeting more. She wanted her Fantoms with full of peaks.

Interestingly, the increased tweeting during a game did not cause any distraction to the sports viewing, but rather tweeting strengthened their commitment towards Cricket. As Rahul mentioned, "*Cricket as you know has a little break in between the overs, which gives me enough time to tweet. In that way, I am letting the world know how I feel when a bad decision happened on the ground, or somebody hits a '6'*."

#### **Tweets were full of emotions**

Participants' tweets showcased a variety of emotions from feeling tensed to feeling overjoyed. Surprisingly, most tweets occurred during crunch situations in the Cricket match. For example, some of the interesting tweets during tense situations were, "*I am feeling the pressure just by watching the game, I wonder how the players stand it…*" "*Nerve, nerve, nerve... this match is all taking it…" ":D :D :D :D, Need 6 more big smiles ... [referring to 4 wickets that have fallen and 6 remaining]*". Besides '4', '6' in the match, other situations such as players reaching personal milestones, or breaking records also generated ample tweets. However, not all tweets were directly related to the match. Sometimes participants even discussed other things such as childhood memories. For example, referring to the drink trolley that typically comes during the break, Shahid tweeted, "*In my childhood, I used to wonder how big this bottle on the drinks-trolley is*."

#### **Physicality of** ***Fantibles*** **facilitated offline display of emotions**

All participants appreciated how *Fantibles* are representatives of their emotions. Rahul said, "*The best part is that through these Fantibles, I can take my feelings offline and show it to others even after the match is over*." Shahid, on the other hand, expressed with joy, "*Like most fans, I love to express my opinion, anger, disappointments and joy during sports. Previously I was expressing myself vocally and sometimes with the tweets, the only change, I see here is now I have a physical record of it (by looking at Fantibles) and that's nice*."

#### **Abstractness supported public display of emotions**

Three participants liked the abstract display of their excitement levels through Fantoms. Samira said, "*Sometime I put my frustration in very strong way. Those frustrations, I do not want to be revealed in public. But with these models, I can now showcase these feelings in an abstract level. No one can see my words, all they see is high peaks and I think this much of expression is tolerable in public*."

#### **Abstract design facilitated personal narration to unlock its meaning**

The abstractness of the *Fantibles* not only concealed their emotions but also gave participants an opportunity to narrate their subjective experience of the match to interested viewers. Heather was thrilled with how the models depicted her emotions and said, "*When my colleague picked up the souvenir in the office, she said it was good for decorating. But she didn't know how to read it. It made me feel like if the message was encoded only for me and that I am the only one who can unlock its meaning*."

#### **Participants wanted to make** ***Fantibles*** **social**

Although all participants liked the personal aspect of *Fantibles*, they all wished if *Fantibles* could embed social elements such as data from their friends. For most, tweeting

was a routine activity with which they connect with their remote friends while watching a cricket match. Samira mentioned, "*When we post our feelings there, it gives us the feeling of being and watching together*." Heather, on other hand, wished to incorporate the stadium noise or crowd thinking about the match within the design. For her, it would be cool to compare her emotional response with her friends and other people in the stadium. She further added, "*It would be really great to take these ideas to the stadium and then record and compare your team and opposition team's support over the game*." Nelson remembered about the soccer stickers that he used to collect during his childhood, he said, "*Fantibles reminds me of completing a soccer album when we friends used to get together and change stickers*." He wanted to extend *Fantibles* to support similar experience.

## DISCUSSION

We discuss participants' responses to *Fantibles* across four themes as below.

### Self-expression

Twitter supports individuals' self-expression by allowing users to create a desirable representation of themselves to other people through their tweets [4]. Within a sports context, Twitter supports an individual's self-expression and allows them to display their passion towards the sports through their tweets and offer a way to connect with other fans. Rinehart [39] highlights the desire of many sports fans, who want to be 'players' themselves, not as to participate in the sport but rather to make their opinion and presence count in the sport event as a whole.

Lowenthal [32] writes, "Individual memories convert public events into idiosyncratic personal experiences". He further adds that, "we recall only our own experiences at first hand and the past we remember is innately our own". As such, *Fantibles* captured an individual's narrative (commentary) on sports and reinforced its significance and meaning for later usage through transforming it into a tangible souvenir that resonates with the identities of the sports fan. The use of personal tweets acted as a physical signature that made the *Fantibles* authentic. *Fantibles* served as a tangible testimony and an official recognition of being a sports fan. As a result, participants developed an emotional attachment with the memorabilia. Their public display in different parts of their home further facilitated exhibition of one's devotion to sports, creating an alternate representation of self [17]. For instance, Shahid took pride in displaying his *Fantibles* to his friends and visitors to his home and it allowed him to share good and bad memories of the cricket match he passionately witnessed.

Van den Hoven [48] wrote about the esoteric qualities of the tangibles that hold a special meaning for their owner but can remain obscure for others. In the sports context, a typical cricket ball can be purchased for 20$ but even the picture of the same ball gets sold for massive prices if there is a distinct memory associated with it such as being used in an iconic match. If you bring home such a cricket ball that represent an iconic event or special memory, others might find it hard to differentiate it from other ordinary cricket balls as they do not hold the same memory. As such, memorabilia relate to memories of personal experiences and require narration from the owner to unveil the story behind them. In other words, the meaning of the sports memorabilia is not in the tangible object but is in the mind of its owner. As Heather experienced, her colleagues wanted to know how to interpret the *Fantibles*, and required her narration to explain the meaning behind large emotional peaks. This feature provided her with a sense of privacy and control over information that she wants to share with others.

### Layered Sense Making

The player facts and the sports analytics are a core part of fan's intellectual engagement with sports. By exploring individual's social media contribution, we see a potential of going beyond the 'facts and the data' about sports and an opportunity to explore other complementary aspects of sports centered on an individual's subjective experiences. In *Fantibles*, we focused not only on the 'facts' and 'data' ('tell-a-tale") of a Cricket game but we also put an equal emphasis on individual's contribution to the game of Cricket as expressed in their tweets. Earlier studies also suggest that people find opinions in shortened forms such as in Twitter easier to understand as opposed to longer writings in news stories and blogs [3]. However, as per the nature of social media, the generated tweets embody a digital format and accessing back key moments from one's own tweets or reflecting back upon one's emotional state during the match requires browsing and scrolling through pages of tweets. We note that, although twitter limits a tweet to 140 chars, there is no limit on how many tweets one can send during an ongoing sports event.

The *Fantibles* through its abstract design offered a quick way for individuals to see an abstract summary of one's tweets (particularly, emotions). Participants welcomed the tangible aspect of the memorabilia, which takes them away from the screen. According to Kaplan and Kaplan [25], a restorative physical environment clears the mind from unwanted thoughts and provides opportunities for broader reflection by directing attention to only key aspects. A sports memorabilia should, therefore, avoid providing too much information by keeping the data mapping simple and direct. The memorabilia presents the summary of the sports along with tweets in a way that can be perceived at a glance to the fan. Participants also liked the interlocking nature of the *Fantibles*, which provided them with the opportunity to add more layers if the fan wanted to expand meaning. For example, as a future work on *Fantibles*, we can add a third layer of data printed on a piece of paper that displays textual sports and tweet data. Users can then utilize this extra layer along with the *Fantibles* as a navigator to extract further information as shown in Figure 9.

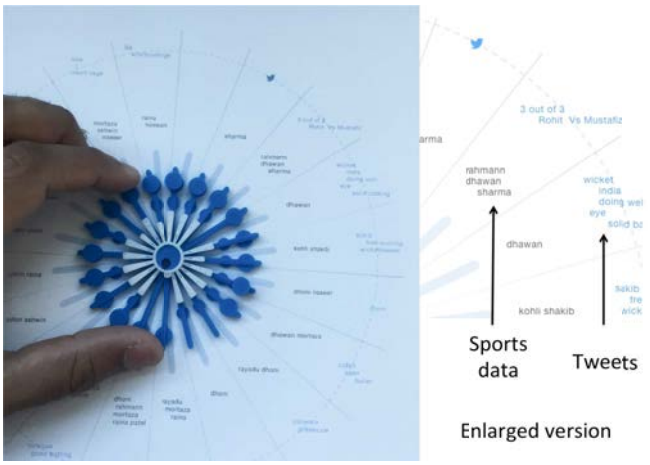


**Figure 9: An example of layered meaning making approach where fans can print textual data of tweets and sports and then use *Fantibles* as a navigator to extract further details.**

### Ad-hoc Interactions

In line with earlier studies [27, 29, 48], participants preferred a memorabilia that is visible in the surrounding, and that they can interact with using their hands to derive further meaning. Sports memorabilia therefore should have an affordance of 'place' as well as 'use'. Miller [34] described the tendency of material artifacts to disappear in the background, which he calls as "humility of things". As a result, although memorabilia are visible in the surrounding, they are not the sole focus of attention. Therefore, in order to make them noticeable, memorabilia should support ad-hoc interactions with individuals as they move around in the surroundings. For example, two participants attached magnets to *Fantibles* and then put *Fantibles* on a refrigerator so that they became noticeable in everyday activities. Such an approach supported frequent ad-hoc interactions with *Fantibles*.

Material artifacts also acquire additional meaning as people reflect on them over time [29, 35]. A recent study on sports memorabilia also highlighted the importance of narrative and the need to support emergent behavior in the design of sports memorabilia [49]. Our study also reflected that most participants wanted their *Fantibles* to age well, hence appreciated use of material that can resistance wear and tear, however it also brings forward the topic of environmental sustainability, which could be addressed through selective printing and using biodegradable materials.

### Distributed Social Interactions

According to McMillan and Chavis [33], shared emotional connection is one of the four key elements that contribute to the sense of community. Emotional bonding among the communities can hold true despite the geographical barriers. People interact with their distant friends by starting discussions on public forums, retweeting, posting on Facebook and get a sense of being connected. As Samira mentioned in the post-interview, how she remained connected with her friends through Facebook and how they enjoy each match their team plays through chats as if they are all in the same room. We believe that incorporating intrinsic spatial and social qualities of being a part of the crowd could further enhance the individual's sports viewing experience at home. For instance, Heather highlighted that the sports are often a collective social viewing experience, therefore adding data such as her interactions with friends on social media or crowd noise from the stadium would provide additional ways to relive and celebrate shared memories. Having such social memorabilia could make watching sports together more enjoyable and could invite discussion even after the event has ended. We suggest using a modular interlocking structure as practiced in our design to embed data from multiple sources. For example, friends can stick their Fantoms on top of one common Sportoms, to correlate their excitement levels.

## CONCLUSION

This paper presents *Fantibles* as an exploratory design to enhance the home viewing experience of sports fans. We designed two separate models: Sportoms and Fantoms that embodies different data sets but when interlocked together provide an understanding of how a fan's excitement unfolded with the sport event. We found that the sports memorabilia gave individuals opportunities to experience and perceive events on a physical 3D interface. Our findings indicate how sports fans make meaning of *Fantibles* and value them by making them a part of the home ambience.

Although we explored only one sport (Cricket) through one representation, we believe this paper contributes to the knowledge of personalizing sports memorabilia through four conceptual design themes that designers can utilize to extend the work to other sports. Our goal behind this work was not to propose finished final design; rather we aimed to provoke discussions and critique around prolonging the experience of sport events through reminiscence and looking into tangible qualities. To this end, this work opens up new exciting opportunities for creating sports memorabilia through the use of personal social media. We hope our work helps to drive DIS forward in terms of design that encompasses a wide world of sports with exciting new technologies that support the qualitative audience experiences of passionate people.

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