



## eBee: Merging Quilting, Electronics & Board Game Design

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### Abstract

eBee is a strategic board game that merges quilting, e-textiles and game design to bridge the gender, ethnic and generation gap in electronics. The game revolves around placing quilted tiles embedded with conductive fabric on a hexagonal grid. The goal is to complete a circuit by laying a path of conductive fabric between a centralized hub or power source, and satellite islands that illuminate when the circuit is completed. eBee aims to merge the social contexts of the female-friendly experience of a quilting bee, the multi-generational appeal of a board game, and the techno-creative practices the maker movement. While the game has stand-alone integrity as both an interactive artwork and a game, it also has the benefit of engaging players in learning about electricity. In addition to exhibiting and possibly selling the game as a completed product, we also plan to develop eBee workshops and an online set of instructables that encourage people to create their own eBees.

### Author Keywords

eTextiles; quilting; game design; artgame; maker community; gender and technology.

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## Introduction

eBee is a STEAM (science, technology, engineering, arts and math) project that merges the traditional craft of quilting, the accessible fun of a board game, and “maker” and hacking culture to create a social experience that bridges gender, ethnic, generational and social gaps associated with electronics and craft. The eBee team (aka “Pins & Needles”) is developing the project along three tracks: 1) An interactive artgame installation of a one-off handmade version for exhibition; 2) A product for consumer and educational markets; 3) A web-based set of instructables that allow maker, quilting and gamemaker communities to create their own eBee variations.

## Artgame Iteration

For CHI Interactivity we are presenting the current iteration of the artgame version of eBee (Fig. 1), a one-off handmade board game that comprises a quilted game board and a set of cotton quilt tiles outfitted with conductive fabric and LED lights. The goal of the game is to create a path of conductive fabric from the central hub, or power source, to one of a number of islands scattered throughout the board, and back to the power hub. To complete a circuit, players place hexagonal tiles onto the quilted game board by affixing the tiles to conductive Velcro at the intersection of each hexagon on in the grid, being sure to connect positive to negative charges (Fig. 2). When the circuit is completed, the island lights up. The game can be played in either competitive or co-op modes. In either case, by the end of the session, players have collaborated to produce an illuminated quilt, based on understanding the basic principles of electricity.



**Figure 2:** Individual pieces with conductive fabric and Velcro completing a circuit.



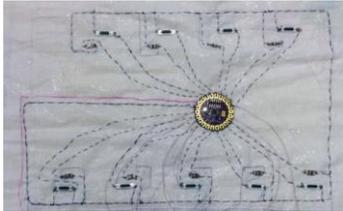
**Figure 1:** Current Artgame iteration of eBee at IndieCade.

## Modes of Play

eBee offers three modes of play:

1. Two-Player Competitive: Two players compete against each other to complete a circuit and light up an island.
2. Team-Based Competitive: Two teams of two to three players work together to complete a circuit.
3. Co-Op Puzzle Mode: Any number of players work collaboratively to complete circuits, experimenting with the various properties of electricity to create circuits and fill up the entire board with tiles.

The game was initially designed with the first and second modes in mind. The “Puzzle Mode” arose out of numerous play-throughs during workshops and exhibitions where players emergently fell into the Co-Op Puzzle Mode after playing either the Two-Person or Team-Based modes of the game. Puzzle Mode has turned out to be particularly fruitful from a learning perspective as it promotes trial-and-error discovery of the properties of electricity through exploration.



**Figure 3:** Early iteration of eBee as part of Foundations of Digital Games Workshop.

### Exhibition History

As of this writing the eBee has been shown in various iterations in a number of contexts. These include:

- Foundations of Digital Games, May 2015, Pacific Grove: Hands-on workshop of the game's first iteration as part of FDG Crafts Workshop (Fig. 3).
- SIGGRAPH, August 2015, Los Angeles: Live demo in SIGGRAPH Studio & Artist's Talk (Fig. 4).
- IndieCade, October 2015, Culver City: Hands-on demo exhibited at booth in IndieCade Village. (Fig. 5)
- Tech Poetics, Harvard University, October 2015: Hands-on demo session.
- NYC Arcade, December 2015, NYU Game Center: Open format hands-on demo session.
- Indie Arcade, Smithsonian Museum of American Art, January 2016: Juried exhibition of independent games (Figs. 6 & 7).

### Goals: Creative Disruption

The long-term goal of eBee is to facilitate the development of "eBees" in a variety of communities and contexts. A soldering iron alongside a sewing machine is a powerful vehicle for interdisciplinary collaboration and peer-learning. Bridging quilting and craft culture with electronics and technology maker communities, creates the potential to diversify participation in STEM and IT fields:

1. Women & Girls: Quilting is historically and traditionally a feminine craft. Our research and the research of others has shown that creative activity, especially in a community setting, can be a strong motivator for women and girls in acquiring STEM skills.<sup>1,2</sup>



**Figure 4:** SIGGRAPH Studio eBee variant using conductive tape to connect circuits between tiles.

2. Underrepresented Ethnic Groups: As an international folk tradition, quilting and other needlecrafts have a strong representation of ethnic minorities. With their heavy reliance on geometry, quilts are often cited as an example of STEM practices in culturally-situated folk traditions.<sup>3</sup>
3. Intergenerational: Quilting is a highly intergenerational folk craft. Modern quilting is the center of a vibrant technologically-facilitated international community that is already engaged with high-tech machinery such as computer-enabled sewing machines.<sup>4,5</sup> At the same time, games are a part of the everyday lives of young people across varying ethnic groups, economic and cultural backgrounds.



**Figure 5:** Completing a circuit to light up a tile on the IndieCade iteration of eBee.



**Figure 6:** Playing eBee at the Smithsonian's Indie Arcade.

### Future Plans

We have partnered with Boston Arts Academy, The Peabody Essex Museum in Salem Massachusetts, as well as regional maker and quilting communities to propose a series of ongoing workshops around the eBee concept where participants would collaborate to create their own eBee variations.

Our plan is to work with a variety of participants, including groups that are typically underrepresented in STEM fields, such as older women and youths of color, to bridge the gap between crafting, making and games. In Phase 1 of this program, we plan to bring adults from (typically female-dominated)<sup>6</sup> quilting centers into (typically male-dominated)<sup>7</sup> maker spaces, and vice versa. This will help to familiarize participants with common tools and techniques, and cultivate a culture of inclusiveness and peer-learning across these very similar but vastly divided practices.

As part of Phase 1, we plan to recruit adult participants as trainers for Phase 2. Phase 2 will engage a game club at a STEAM (Science, Technology, Engineering and Math) Lab within an ethnically diverse local arts high school, and a family maker program within an art museum context. By bringing these communities together, we hope to build a bridge between maker and craft communities, young and old as well as different ethnic groups and backgrounds.

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**Figure 7:** Planning out a circuit at the Smithsonian's Indie Arcade.