Brian Yang & Janill Lema
Section 001

Engineering Memo

For our project, Janill and I created County the Counting Turtle, a toy that teaches a toddler how to count through interaction. Our design incorporates a turtle body, worm gear, rotational movements, path-tracing, and visual display. The toy represents the structure of a turtle. The shell is connected to the back of the toy, acting like a hinge-like cap. The worm gear connects to the front axle of the wheels and the mid-center of the rotating plate; therefore, the plate rotates in the same ratio of the rotation of the wheels. On the rotating plate, we have nine half-arcs that are equidistant from each other and from the center of the rotating plate. There are engravings of numbers one to nine around the side plate, aligning with the front plane of the half-arcs. Another circular plate with a one by three inch rectangular slot is included to support the rotating piece and to display only one number among the nine numbers. On each of the arcs, we have an organic toy fish that traces through the path of the arc. The child can bring down the fish until it touches the rotating plate. Each face of the fish displays an amount of stars pertaining to the number on the plate. The overall design works by rolling the turtle across until a number appears on the slot of the plate. For example, the child brings down the fish, plays around with it, and sees that there is a star on the fish and a display of number one on the slot. The child learns the number by visual representation and physical interaction. The child then rolls the turtle until another number appears on the slot, number two. The child brings down the fish again and sees two stars on the fish, realizing there is a pattern. The child does the same step seven times and learns how to count from one to nine.

Our incorporation of design intent comes from our purpose of having the child to interact with the toy and learn how to count at the same time. The interaction aspect influenced our decision to have a worm gear that controls the rotating plate and frontal axle. The numbers one to nine appear on the side of the toy as it rolls forward continuously. The arcs were created to enable the child to bring down the fish, see the amount of stars, and correlate it to the number shown on the side of the plate. The shell is incorporated to protect the inner-workings of the half-arcs and fishes. The shell was also meant to make the toy easily transportable.

The difficulties modeling this device comes from the creation of the turtle and fish structures, implementation of the gears, and display of numbers. The organic modeling of the turtle's face and body includes multiple splines and loft features. It was our first time using worm gears, therefore we had to research how to mate them so that they could function correctly. Engraving the numbers on the side of the rotating platform was difficult to carry out since we had to use features we never used in class such as text and inserting planes at an angle. Some of the engineering decisions we had to make were figuring out the ratio of the worm gear, designing the body of the turtle, creating angle mates between the fish and the rotating plate so that the fish could not go through the plate, making sure the plate rotates in a realistic manner, and figuring out the proper measurements of each part. We also had to reconsider and modify certain aspects of our original idea as we worked through the project.

#2 rolling Turtle counter

more detailed view

move ring into middle

rotates outer shell to show number

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