To: Dr. Svarovsky
From: Group 3 (Meg Ryan, Sae Rome Choi, Josh Redoute, Griffin Collins, Jack Gergets)
Date: November 12, 2015
Re: Pet Design Proposal Proposal

Needs Assessment

The objective of this project is to develop an interactive robotic pet prototype for our customer, the Wazowski Toy Company. It is important to note that our customer, despite being a children's toy company, has a main goal of making every toy enjoyable to as wide of an audience as possible. In addition, the pet must mirror the high quality that our customer has become reputable for.

Problem Formulation

Explicit requirements of the pet include that it must resemble (in appearance and behavior) a realistic or fictitious pet and be built solely from the equipment provided by the EG10111 staff. Additional items may be used to make the product more closely resemble the desired pet so long as they do not permanently modify or damage any of the classroom's equipment. All computer programs executed by the pet must be developed as a finite state machine and downloaded using the NXT and associated LabVIEW software. The pet must possess four distinct features, including the capability to move without running into obstacles, with at least one state using the NXT graphical display and/or sound capabilities. Also, the pet must incorporate at least two different LEGO NXT sensor types.

As for implicit requirements, the pet must obviously be appropriate for children ages 6-11 in both content and complexity since the customer is a children's toy company. The type of pet should be easily identifiable to children and adults alike by its design and behaviors.

Despite the obvious constraint of our limited experience programming with LabVIEW and LEGO Mindstorms, our group realized that we were limited in possible pet features by the motors sole ability to rotate. When being used in the customer's home, the operating environment could include a number of surfaces such as carpet, hardwood floors, or tile. For these reasons, the pet prototype must be capable of performing locomotion when in contact with variable amounts of friction. For the operating environment of Demonstration Day, we would prefer to test in the atrium where friction is at a minimum.

The engineering environment is limited to our given NXT kit, and other visual materials. Our robot will use all three motors, with two of them for movement, and one of them for the motion of the jaw. We will use the ultrasonic, sound, touch, and light sensors, which each trigger a different function. Once the robot is built, and has functions, we will use something that looks like fur to make it look like a lion.

Abstraction and Synthesis

Our pet prototype will resemble a lion that will consist of the block as the body, four legs with wheels attached to each, a tail and a head. One motor will be attached to each front leg allowing for movement forward and backwards in addition to turning, and a third motor will be used to open and close the jaw of the lion. Three sensors will be used in our prototype: an

ultrasonic sensor attached to the front, a touch sensor attached to the upper body, and a light sensor also attached to the front. The body of the described pet prototype can be seen in Figure 1, below.

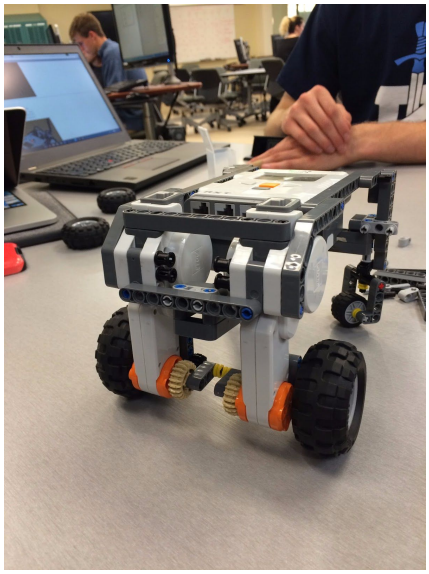

Figure 1. Pet Prototype

We believe that this pet prototype will be appropriate for the intended customer because the lion is capable of moving independently of the user and can react to different stimuli within its operating environment. Lions are often of interest to children since they are not common in our geographic area. In addition, lions are a very active species and therefore are much more entertaining than a sedentary animal. As for the toy company, they reportedly specialize in creating toys that are innovative, which we believe the interactive and responsive features of our toy reflects.

For the locomotion function, we will use the ultrasonic sensor. The robot will have two motors, and two caster wheels, so it will roll on the ground. The robot will move without prompting, because a lion is always stalking its prey. The ultrasonic sensor will be used, so that when the robot approaches an obstacle, it stops, and backs up.

Another function our robot will have is “roaring”. For this function we will use the touch sensor. When the touch sensor is touched (as if a person pet the “lion”), the robot will make a loud roaring noise, using the speaker in the brick.

Another function our robot will have is the ability to “eat” as in, move its jaw up and down. The input for this function would be when the light sensor detects darkness (as if the lion was close to its prey). The robot will then use a motor to move its jaw up and down, “eating” the prey.

Another function is when the sound sensor detects a loud sound (such as a rival lion) the robot will turn around, using the motors, to make sure there is nothing dangerous behind it.

During our demonstration, our pet prototype will require physical adjustments by a team member to fulfill the roaring function. The roaring function requires the toy’s user to touch the touch sensor, because the roaring occurs when somebody or something bothers the lion by petting it.