

KIBO Puppet Construction Information



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Bill of Materials

Item	Price Per Unit	Quantity	Total
Adhesive Spray	\$5.99	NEGL	NEGL
Cardboard*	N/A	N/A	N/A
1 in. Foam	\$5.99	0.5	\$3.00
2 in. Foam	\$11.99	0.25	\$3.00
Black Felt	\$3.59	0.5	\$1.80
Cream Felt	\$0.33	0.1	\$0.04
Green Felt	\$0.33	0.1	\$0.04
White Felt	\$3.59	1	\$3.59
Ornamental Mini Gears	\$7.75	0.17	\$1.29
Cream Quilter's Square Fabric	\$2.49	1	\$2.49
Orange Quilter's Square Fabric	\$2.49	1	\$2.49
Black Spray Paint**	N/A	N/A	N/A
Stuffing	\$10.00	0.10	\$1.00
Velcro	\$10.99	0.1	\$1.10
Additional Material for Details	< \$5.00	N/A	< \$5.00
			\$24.84

*Salvaged from recycling

**From Peter's personal supplies, negligible amount used.

Specifications

Body	8.5" x 10" x 3"
Motion Sensor	Oval: Height - 3.25", Length - 1.75" Width: 3"
Distance Sensor	Largest Cylinder: Diameter - 3", Width - 1" Medium Cylinder: Diameter - 2", Width - 1" Smallest Cylinder: Diameter - 1", Width 1"
Audio Sensor	Ear Shape: Height - 3.5" Width: 2.25"
Lightbulb	Lightbulb: Diameter - 4", Height - 7.5", Shaft Length: 2" "Socket": 2" x 2" x 1.5"
Wheels	Diameter: 5" Green Felt: 2" x 1.5" Cream Felt: 2.5" x 2"
Velcro	12 1.5" Strips

Instructions

1. Building the Body

1. Cut one 8.5" x 10" piece from the 1" cushion foam and then another from the 2" cushion foam.
2. Cut two pieces of black felt where one is 8.5" x 13" and the other is 8.5" x 14".
3. Hot glue the 8.5" x 13" piece of black felt to a face of the 1" cushion foam. The black felt will dangle off the face of the foam, hot glue it the side and the other face of the foam. The side with the black fabric will be the back end of the puppet.
4. Repeat the previous step with the remaining piece of felt and 2" cushion foam.
5. Hot glue the two cushions together by outlining the edges of the black felt with hot glue. Place the cushions together and press down until the glue is dry. Check that the glue has bonded the foam together, add additional glue when necessary. The 2" cushion is the top portion of the puppet.
6. Out of the white felt cut three pieces, two 8.75" x 10.25" pieces and one 3.25" x 28.25" piece. Sew these pieces together to create a sleeve for the foam body.
7. Repeat the previous step with quilter's square; using the cream quilter's square for the 8.75" x 10.25" pieces and the orange fabric for the 3.25" x 28.25". Iron the fabric before sewing and hem the sides that will face the back of the puppet.

(**To make the fabric fit around the puppet snugly and cleanly, it is better to air on the shorter side for the white felt and a bit longer for the quilter's squares. Unfortunately, the orange quilter's square is not long enough for a full 28.25" piece, so two pieces need to be sewn together to create the desired length. A sewing machine is only useful when sewing the sleeves. All the other components are too small and detail oriented for a sewing machine.)

8. Slide the white felt sleeve over the foam body. Adjust the fabric so there are no creases or bunches. Then slide the sleeve of cream and orange fabric over the foam body.
9. On the large faces, spray a little bit of glue adhesive onto the foam and press down the white felt. Then spray the glue adhesive onto the white felt and press down the quilter's square.
10. Place four 1.5" pieces of velcro (loop side out) on the top face of the body. The four should be evenly placed across the face: 2.875" from the 10" edge and 3.375" from the 8.5" edge.

2. The Components

1. The Motion Sensor

1. Out of the cream fabric, cut two identical ovals with a height of 3.25" and a width of 1.75".
2. Once cut, measure the circumference of the ovals. Using the circumference as the length and a width of 3", cut a rectangle from the orange fabric.
3. Sew one cream oval to the length of the orange fabric. Repeat on the other side with the other oval.
4. Fill the component with stuffing and then sew the remaining seam.
5. Cut out a circular pupil from the black felt and hot glue it to the center of the eye.
6. Hot glue a 1.5" piece of velcro (hook side out) to the bottom seam, 0.75" from the front.

2. The Distance Sensor

1. Cut out two circles from the cream fabric with a diameter of 3".
2. Cut out a rectangle from the orange fabric with a width of 1" and a length of 9.625".
3. Sew one circle to the length of the orange fabric and then the other circle to the other side.
4. Fill the circle with stuffing and sew the remaining seam.
5. Cut out two circles from the cream fabric with a diameter of 2".
6. Cut out a rectangle from the orange fabric with a width of 1" and a length of 6.5".
7. Repeat Steps 3 & 4.
8. Cut out two circles from the cream fabric with a diameter of 1".
9. Cut out a rectangle from the orange fabric with a width of 1" and a length of 3.375".
10. Repeat Steps 3 & 4.
11. In decreasing order, hot glue each cylinder to the back of the other. Each cylinder should be on the same plane, not centered.
12. Cut out a rectangular pupil with the height of 2.5" from the black felt and hot glue it to the center of the largest cylinder.
13. Hot glue a 1.5" piece of velcro (hook side out) to the seams on the bottom, 0.75" from the front.

3. The Audio Sensor

1. Create a stencil based off the ear shape of the actual audio sensor of the KIBO robot by scaling the stencil to a height of 3.5".
2. Use the stencil to cut out two ear shapes from the cream fabric. Approximate an extra 0.25" for the seam.

3. Estimate the circumference of the ear shape. Cut out a rectangle from the orange fabric using the circumference as the length and 2.25" as the width.
 4. Sew one ear shape to length of the orange fabric. Repeat on the other side with the remaining ear shape.
 5. Add stuffing and sew up the remaining seam.
 6. Beginning on one side of the last seam, insert a needle and thread and pull it out at the curve of the ear. Insert the needle and thread about a quarter of an inch into the orange fabric and pull it out at the seam. Repeat this across the orange fabric. This helps maintain the ear shape even when fully stuffed.
 7. For each ear, cut out three pieces from the black felt to create the outline of the ear. (See an example in Additional Pictures on Page 6.)
 8. Hot glue the pieces of black felt to each side of the ear.
 9. Hot glue a 1.5" piece of velcro (hook side out) to the bottom of the ear, covering the seam (but not parallel to the seam).
4. The Lightbulb
1. Create a stencil for the lightbulb where there is a vertical line of 7.5". Create a circle 2" from the top of the line. Then create the shaft of the lightbulb using the rest of the vertical line below the circle and an additional 2" thickness.
 2. Using the stencil, cut out the two sides of the lightbulb from the yellow felt.
 3. Using black thread, embroider the lightbulb's filament.
 4. Starting at about 0.5" from the bottom of the shaft, sew the sides of the lightbulb together. Sew around the entire part of the lightbulb, except stopping when 0.5" from the bottom of the shaft (directly across from where the seam started).
 5. Stuff the lightbulb and then sew the lightbulb up where the seam stopped 0.5" from the bottom.
 6. Cut out two rectangular pieces of 2" x 2" from the cream fabric and another rectangular pieces of 1.5" x 8.25" from the orange fabric.
 7. Sew one piece of the cream fabric to the length of the orange fabric.
 8. Create a small slit in the center of the other piece of cream fabric. Make it big enough to fit the shaft of the lightbulb. Place the shaft in the slit and move it upwards. The pattern of the cream fabric should face the top of the lightbulb.
 9. Sew the flaps of the lightbulb onto the piece of cream fabric already sewn to the orange fabric.
 10. Move the cream fabric on the shaft of the lightbulb down and sew it to the top of the orange fabric.
 11. Before sewing up the final seam, stuff the little fabric box.
 12. Once stuffed, sew the final seam shut.
 13. Hot glue yellow pipe cleaners to the seam of the lightbulb, around the base of the lightbulb's shaft, and the seam attaching the top cream fabric to the orange fabric.
 14. Hot glue additional pipe cleaners connecting the base of the lightbulb's shaft to the corners of the cream fabric.
 15. Hot glue a 1.5" piece of velcro (hook side out) to the underside of the lightbulb component.
5. Wheels
1. Out of the orange fabric, cut out two circles with a diameter of 5".
 2. Out of cardboard, cut out one circle with a diameter of 4.5".
 3. Begin to sew the two orange circles together. After it's half sewn, insert the cardboard circle wrapped in stuffing. Continue sewing the orange fabric circles together.
 4. Hot glue black pipe cleaners on either side of stitch, and then an another pipe cleaner on top of the other pipe cleaners.
 5. Cut out two 2.5" x 2" rectangles from the cream felt and two 2" x 1.5" rectangles from the green felt. Hot glue a 1.5" piece of velcro (hoop side out) to the green felt and then the green felt to the cream felt. Hot glue the cream felt 1.5" inches from the back of the puppet, 0.75" from the bottom. Hot glue a 1.5" piece of velcro (hooks side out) to the other piece of green felt and then to the other piece of cream felt. Hot glue the cream felt to the center of the wheel.
 6. Take two matching gears, spray painted black, and hot glue one gear to the upper right corner of each piece of velcro/felt trio. The gear should tuck under the velcro, but cover the corners of the green and cream felt.
 7. Repeat Steps 1- 6 to create the second wheel.
6. Other Detail Work
1. The two existing puppets both have features that create the characters of Mr. and Mrs. KIBO. Below are examples based off those puppets.

- Mr. KIBO:
 - Mustache: A pattern was created and was then used to cut out two mirror images of each side of the mustache from a scrap piece of fur. The pattern was then used to cut out two mirror images from black felt. A piece of fur was sewn to a piece felt and filled with stuffing before being sewn shut. The pieces of the mustache were then glued to front of the puppet.
 - Eyebrows: Four identical rectangles were cut out; two from the scrap fur and two from the black felt. A piece of fur was sewn to the black felt and filled with stuffing before being sewn shut. They were then hot glued to the motion and distance sensors.
- Mrs. KIBO:
 - Lips: A pattern was created and then traced onto pink felt. The lips were cut from the pink felt and the line for the mouth was drawn on with a black permanent marker. The lips were then hot glued to the front of the puppet.
 - Hat: Two circles with a diameter of 3", a circle with a diameter of 4", and a 9.5" x 2" rectangle were cut from yellow felt. One of the 3" circles was sewn to the side to the length of the rectangle. After filling with stuffing, the other 3" circle was sewn to the rectangle. The stuffed cylinder was hot glued to the center of the 4" circle. A strip of cream fabric was hemmed and hot glued around the base of the cylinder.

Additional Pictures

