Parts List:

3D printed spout assembly (XX filename)

Printed PCB of control board (XX filename, seeedstudio)

Printed PCB of spout board (XX filename)

Electronic parts:

For control board:

Colored LEDs (1 each yellow, green, blue, red, sparkfun link)

For spout board:

HDMI cable

Ribbon cable

Power cord for Arduino

24 gauge steel tubing

Heat shrink tubing

2 ¼” bright white LEDs (sparkfun link)

1/8” tubing (lots)

4 1/8” barb connectors (WPI)

Some notes on assembly:

1. I like assembling things that might need to be taken apart later (as happens when prototyping a set up like this) with hot glue, and epoxying only the things that really need to hold up. By all means, epoxy if that is your preference.
2. I generally use 5 minute epoxy (I like Z-poxy).

Make the spout tubing:

1. Cut 7 lengths of steel tubing, approximately 5” long
2. Arrange tubes lengthwise, with six tubes surrounding a center tube
3. Solder tubes into place, making sure about 2” at one end is secure, but leaving the tubes unconnected at the other end (I find this easiest if I first wrap the tubes with a wire to hold them in place, soldering the steel is a little bit of a pain, use lots of flux, there might be better way to do this)
4. Sand down excess solder
5. Use a dremel to smooth out both the connected ends. The connected end should be very smooth (this is the end that delivers the fluid).

Assemble the nose cone and tubing:

1. The 3D printed spout assembly is designed in openSCAD, and is designed to print upwards on a 3D printer without support. Prototype parts were printed on a Lulzbot Taz4 (later upgraded to Taz5 print head) using PLA, but ABS works great as well (better in some ways because it is more robust to hot-gluing).
2. Fit the spout brace firmly into the nose cone, and connect using a diamond shaped pin. Hot glue the pieces together from the back of the nose cone and by gluing the diamond shaped pin in place.
3. Fit the metal spout tubing through the nose cone from the back push very far forward, this takes some fiddling
4. Fit the barb connectors into the vertical holder at the back of the tubing brace
5. Pull the metal tubing back, separating a single tube into three of the barb connectors and the remaining four into the last barb connector.
6. You should choose these tubes carefully, I prefer the three tastants to be delivered across the 3 tubes in the middle, horizontal to floor, with two tubes above and two tubes below reserved for vacuum (if you are using a vacuum). You can either color code the tubes before you solder (e.g. marking with different colors of sharpie) or run wire through the tubes to identify the location of each.
7. Once individual tubes are attached to each barb connector, pull the tubeing back so that the spout extends [XX mm] into the nose cone. Epoxy the metal spout, the barb connectors, and the interior of the barb connectors (surrounding the metal tube). I like to use a syringe to fill the barb connectors with epoxy (we need them to be sealed in order to avoid fluid leaks)
8. Once epoxy is set, trim the metal tubes near the barb connectors with wire cutters and sand back gently with a dremel enough to make sure the tube is really open and not pinched closed.
9. Strip an insulated 18 gauge wire for about ½” at the end and wrap around the spout tubes between the two tube holders a the front of the spout assembly. Solder in place. This wire will carry the electrical signal from the spout.
10. Test that all tubes are open by connecting a section of 1/8” tubing to the barb connector and using a syringe to put water through each tube. You want to see the water shoot smoothly out the other end. Watch carefully for leaks at the barb connectors, and seal again if needed.

Wire the cue light LEDs:

1. Use small heat shrink tubing cut to about 1” long and shrink around each LED leg. Color code red for pos leg and black for ground.
2. Fit LEDs into the rear of the openings in nose cone on the upper left and upper right corners.
3. Solder the pos connections together and the neg connections together between LEDs.
4. At the joint between connections, attach about 6” of insulated wire to each connection, color coding red for positive and black for negative if desired.
5. Heat shrink these two wires together if desired, and attach a 2-pin female connector (crimping female pins onto each wire and then fitting into the plastic housing).

Glue together the whole spout assembly:

1. The spout and nose cone assembly fits onto the rectangular brace and is held in place with the diamond shaped pins. You may need to use tweezers or forceps to fit the diamond shaped pins in between the tubing. Hot glue the pieces together.
2. The valve holder fits on top of the rear support of the brace