Reptile Mister

Project Proposal

CSCE 462
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March 22, 2021

Summary

For this project, the team will create a system to automatically monitor the humidity levels of a live vivarium, and activate a misting system at a consistent time every day. The system will send daily email reminders to the user with a summary of the tank's humidity and temperature levels, a visual analysis of the data, and a set of recommendations for system adjustments. Additionally, the mister will detect if there is water remaining in the reservoir, alerting the user and disabling the pump if the water source is empty.

Introduction/Background

Certain reptiles require specific humidity levels to thrive. Crested Geckos (the primary beneficiary of this system) need humidity levels above 50%, and the humidity should follow a predictable pattern through the course of the day. Morning humidity levels should begin at ~70%, fall to ~50% through the course of the day, then rise to ~90% at night.

Managing humidity levels can be a daunting task for new reptile keepers, since many pet owners do not have the time to constantly monitor their pet's humidity levels. Additionally, changes in temperature can affect average humidity levels, forcing the keeper to adjust the amount that they are spraying the enclosure. Additionally, the pet owner must spray the enclosure twice a day to maintain healthy humidity levels. This can "tie down" the owner, preventing them from leaving the pet alone for any longer than a day or two.

Our idea is to build an automated reptile misting system to carefully control the level of humidity within an open reptile tank. This will allow reptiles to thrive in a maintained environment suited to their needs without requiring a person to manually do the misting themselves. This is most ideal for people who have pets that need specific humidity levels, those who often forget about their pet's daily requirements, and owners that need to occasionally leave their reptiles for at least a day.

System Design:

Steps of operation:

1. The most important piece of software functionality in our system is the ability to receive humidity readings back from the humidity sensor at specified time intervals (1 hour), and use that to calculate how much

moisture is needed. There will be many measurements returned over the course of a small period of time, and so appropriate data filtering and averaging will be applied. In our case, we are thinking of having a moving average filter applied to every data point, and then passing them over a threshold to weed out remaining noise spikes.

2. After the raspberry pi has received humidity data and calculated how much water needs to be added to the system, the raspberry pi will run an experimentally-determined algorithm that determines how long the mister needs to be on to reach a desired level of humidity. This measurement will be in units of milliseconds.

3. Once the amount of time the mister should be on is calculated, the raspberry pi will send an “ON” signal to the relay for the determined length of time. This will allow the mister pump to turn on, begin drawing water from the water tank, and spray it into the tank. The spraying will only occur while the relay is signaled to remain on by the raspberry pi. As soon as that signal changes, the mister will stop outputting water into the system. This process will happen once per day, to maintain a consistent humidity rate over the course of a day.

4. At a predetermined time each day (8 PM), the raspberry pi will send an email to a predetermined email address that contains data about the humidity levels over the course of each day. This data will contain the filtered humidity values measured every hour. The raspberry pi will send this data via a wireless connection. This is currently optional functionality that will be implemented if time permits.

5. The raspberry pi will also power a water level sensor that constantly monitors how much water is remaining in the mister’s water tank. If the level drops below a predetermined threshold that corresponds to 2 days left of consistent misting, the raspberry pi will notify the user via email about the status of the water tank level. The raspberry pi will also trigger a small buzzer at consistent intervals (every hour) to notify the user through sound that the tank needs to be refilled. This is currently optional functionality that will be implemented if time permits.

Components/Sub-Systems:

1. Power source - The power source will provide a constant power supply to the raspberry pi.

2. Humidity sensor - Records data of humidity levels, sends information back at desired sampling rate to raspberry pi. When the time interval arrives, it will take many measurements over a short period of time, and send them to the raspberry pi. This will be powered by the raspberry pi.
3. Raspberry pi - Will run the algorithm to detect humidity, calculate the appropriate amount of water needed to reach a desired humidity threshold, and turn on the relay controlling the water pump to output a desired amount of water. Additionally, the raspberry pi will be able to send information via email to the user about humidity data every day. The raspberry pi will also monitor the remaining water level in the water tank, and notify the user loudly via a buzzer and email if water is low. This will be powered by the power source.
4. Relay/water tank/mister pump system: These three devices will work in tandem to output a desired amount of water to the tank. The mister will consist of one line of tubing stretched out over the top of the tank, with at least one mister nozzle for spraying water. When the relay is triggered, power will be connected to the water pump/mister, which causes the mister pump to pull water from the tank and then spray it out. When the relay is turned off, all power to the system will be lost, and the mister will stop spraying water. This system will be powered by a 12V wall connection, spliced to a relay device.
5. Water level sensor/buzzer system: These two devices will work together to alert the user when the water level in the tank is reaching a critically low level, which is defined as likely to run out in two or fewer days. The water level sensor will send data back to the raspberry pi continuously, and if the value of the sensor indicates a . This is currently an optional piece of functionality that will be implemented if time permits. This system would be powered by the raspberry pi.

Bill of Materials

Item	**Cost**	**Shipping Time**	**Already Owned ?**	**Source**
Humidity Sensor	$7.69	1 day	No	Amazon

Float Sensor	$5.91	1 day	No	Amazon
Piezo Electric Buzzer	$5.59	6-7 days	No	Amazon
Water Pump	$22.99	4-5 days	No	Amazon
Mist Irrigation Kit	$19.99	1 day	No	Amazon
Short extension cord (to splice into relay module)	$3.49	1-2 days	No	Amazon
Suction cups	$5.50	3-4 days	No	Amazon
Water bucket	$19.99	3-4 days	Yes	Amazon
LED Light	$4.99	1-2 days	Yes	Amazon
Raspberry PI 4	$61.88	1-2 days	Yes	Amazon
Relay Module	$5.79	4-5 days	Yes	Amazon
Total Cost (Not including items that are already owned)	$71.16			

Request for Reimbursement

This project will not require reimbursement.

Tentative Work Schedule

Week	**Expected Progress**
Week 1: 3/15 - 3/22	Create proposal, create high level design, choose components and vendors
Week 2: 3/22 - 3/29	Purchase materials, identify software libraries/drivers required
Week 3: 3/29 - 4/5	Verify hardware connections/reliability, read and track sensor data
Week 4: 4/5 - 4/12	Connect relay module to water pump and verify software control, create system for sending basic email updates
Week 5: 4/12 - 4/19	Integrate hardware system into reptile tank, refine email

	system to provide visual feedback and recommendations
Week 6: 4/19 - 4/26	Set up water level monitoring system and error messages
Week 7: 4/26 - Final Deadline	Test fully integrated system, record demo, create final presentation

Team Coordination Agreement

“All team members agree to follow the tentative schedule described above unless it is amended. To amend the schedule, both team members must agree to each change. Team members will use GroupMe to discuss technical issues and deadlines, and team members will commit to checking the GroupMe at least once per day to promote active communication. Team members will use the Slack channel to document project progress and post pictures/videos of systems when they are finished.

Both team members will purchase the sensor/controllers that are used in the system, but only one team member will be required to purchase the pump and misting kit that will be used in the final vivarium. Both team members assume equal responsibility in the success or failure of the project, and agree to an equal distribution of work and credit.”

Electronic Signatures:

Jonah Taylor

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