

9/27/2019



Team 510: Climatic Camera

Functional Decomposition

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Functional Decomposition Description

To determine the functions necessary to have a monitoring device inside the climatic chamber, the group split up the basic processes that the proposed solution would need to have. The group developed a few potential solutions, existing and brainstormed, to guarantee the chosen functions could apply to differing alternatives. Each system was then determined by breaking down the general processes that any of these solutions demanded. The monitoring device referred to as “climatic camera” from here forward was broken down into the following systems: support, monitor, isolate, and provision.

The system, support, is the first step that contains a mounting mechanism for the climatic camera. The camera needs a stable housing for visuals to be optimal. In addition, the support needs to be movable when needed and but secure when no movement is desired. The specific verbs used to describe the functions in this system include: provide, prevent, and secure. Provide implies that the device will provide stability for the camera. Prevent implies avoiding/dampening vibrations for the most stable and consistent video images. The final verb, secure is separated into two functions; the first implies securing the position of the device in the x, y, and z axes, the second implies securing rotational angles for desired recording orientation.

The system, monitor, is the only feedback that is generated from the device. The monitor system consists of the camera itself and the computer interface. The system captures the visuals, transmits, and archives them. The stored visuals can either be transmitted remotely to a home network to be viewed off site-site or displayed on the adjacent computer. This gives the user the ability to reference the time of failure and relate them to the corresponding parameters of the chamber.

The system, isolate, is the primary design feature of the device. The device needs to be protected from the various conditions inside the climate controller to maintain the camera's recommended operating temperature. With extremely hot and cold fluctuating temperatures, this system is the primary focus of the project and will take the most considerable design. The isolation also keeps the device safe from humidity-related inconveniences (such as fog) or failure.

The system, provision, is the power source for the device. This system provides the camera with stable power to be operated the entire duration of the test. The power supply is regulated, keeping the device safe from overheating or incurring excessive stress on its sensitive components. It also allows for a more compact design inside the chamber due to the absence of an attached power supply. The user also does not have to be as involved with the process since the power source is run externally.

Task Analysis

The task analysis describes step by step procedure that could apply to any solution. In order to properly understand the desired outcomes for the product, the group needed to understand each action that is performed within the process. The group attempted to boil down what the solution must do to its most basic actions, and realized the product had 6 distinct actions in order to fulfill its purpose. First, the device needs to be mounted. Once mounted at the desired position, the device needs to be powered. Then, the device needs to be connected to the computer interface to power the device and provide a means for data transfer. Once connected, the device can begin to collect data, then transmit said data to the computer interface. Finally, the device needs to store the data that has been recorded for potential future access.

Hierarchy Chart

As explained in the functional decomposition description, the defined systems of the climatic camera were placed with the functions mentioned and compiled into a hierarchy chart as shown in Figure 1.

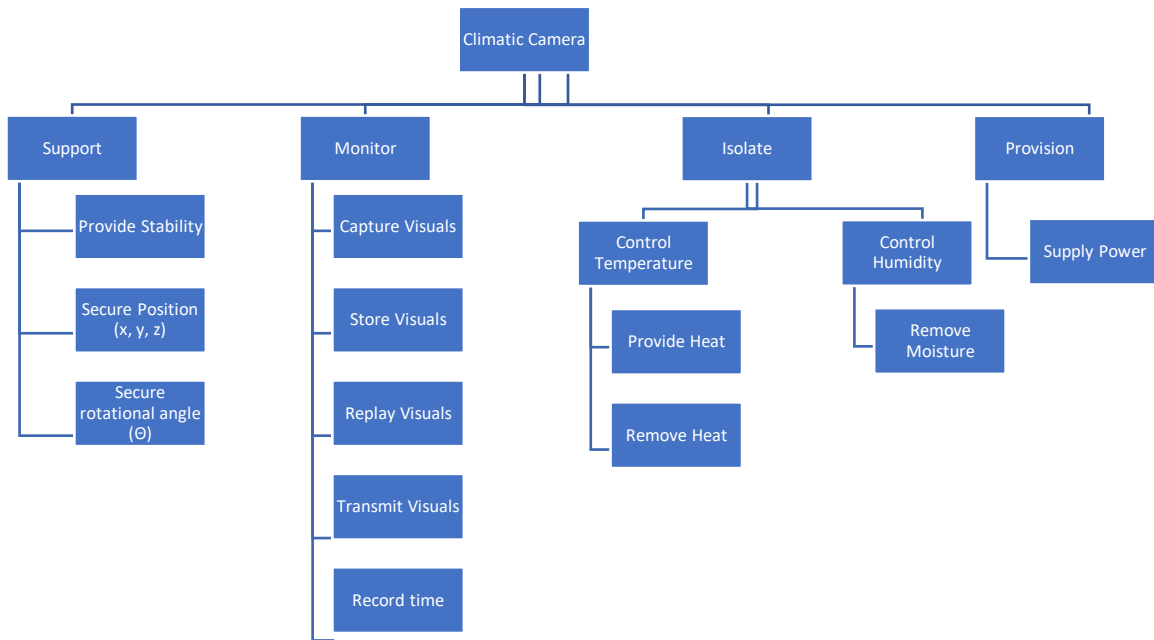


Figure 1: Functional Decomposition Hierarchy Chart

Cross Reference Table

Table 1 below shows the four main systems on the top row. The left column contains the functions of those systems. If a function corresponds to a system, that box is marked with an “x”. As mentioned previously, the most important system is “isolate.” Without isolation the system would not work, because of this, the functions that are under isolate are given top priority. It can be seen from the table that some of the functions are applicable to more than one system. The functions that fall under more than one system are considered to have priority in the functionality

of the device. All functions that are alone within their respective systems are crucial to fulfill in that stage. Using the cross-reference table allows for imperative functions to be seen easier across different systems.

Table 1: Cross Reference Table

Functions	Systems			
	Support	Monitor	Isolate	Provision
Provide Stability	x	x	x	
Secure Position	x	x		
Secure Rotational Angle	x	x		
Capture Visuals		x		
Store Visuals		x		
Replay Visuals		x		
Transmit Visuals		x		
Record Time		x		
Control Temperature			x	
Control Humidity			x	
Supply Power		x		x

References

McConomy, S. (2019, February 2). Engineering Characteristics, Functions, Targets, and Metrics.
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