

# **Input-Corrective Drawing Tablet Specifications**

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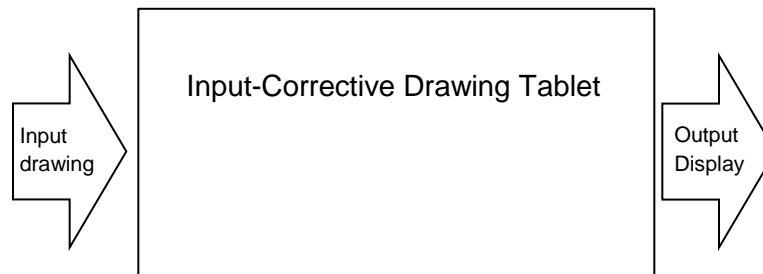
## 1 SCOPE

This document describes the requirements and verifications of the Input-Corrective Drawing Tablet. This system is a compact device that can be drawn on using a stylus and output a corrected drawing to a desktop computer. The software in the system corrects shaky input and learns what a user is intending to draw. The system then modifies the drawing according to the user's intents and outputs the corrected drawing to a desktop computer via USB.

## 2 Engineering Requirements

### 2.1 Item Description

The Input-Corrective Drawing Tablet is designed to take an input from the user, alter the input given, and output a corrected drawing to a computer (refer to Figure 1).



**Figure 1.**

To accomplish this function, the system consists of three modularized parts: an input module, a processing module, and an output module.

The input of the system will be the movement of a stylus across a drawing pad. The output will be the rendering of processed input to the computer screen. The processing of the input will result in a drawing accurate to user intentions (i.e. without shaky inputs)

The non-functional parts of the system consist of physical requirements and environmental factors. The following sections will describe the requirements of the interface, functional, and non-functional components of the Input-Corrective Drawing Tablet.

## 2.2 Interface Requirements

### 2.2.1 Physical

2.2.1.1 The input module shall contain a drawing area of 20 x 15 cm.

2.2.1.2 The system must be transportable.

2.2.1.3 The system must be shock resistant.

## 2.3 Functional Requirements

### 2.3.1 Input Module

2.3.1.1 The input module shall sense 124 levels of pressure sensitivity.

2.3.1.2 The input module must have a coordinate resolution of 500 lines per cm.

2.3.1.3 The input module shall be able to be turned on or off by the user.

2.3.1.4 The input module shall be able to adjust input sensitivity.

2.3.1.5 The input module shall contain a stylus that is comfortable to the user for at least 3 hours of continual use.

2.3.1.6 The input module shall have an accuracy to 0.5 mm.

### 2.3.2 Processing Module

2.3.2.1 The processing module shall be able to detect valid input from the input module and discard invalid input. Valid input is defined as pressure to the drawing pad that originates from a stylus pen. Invalid input is defined as any pressure that originates from a source other than a stylus pen.

2.3.2.2 The processing module shall process the valid input and estimate the intended output.

2.3.2.3 The process module shall improve in accuracy as it is used.

### **2.3.3 Output Module**

2.3.3.1 The output module shall send processed data to a desktop computer through USB.

2.3.3.2 The output module shall send data that is recognized by third party software.

### **2.3.4 Performance**

2.3.4.1 The system shall take no longer than 0.25 seconds to render output to the desktop computer.

### **2.3.5 Error Handling**

2.3.5.1 The system shall be able to detect and ignore invalid inputs.

## **2.4 Non-Functional Requirements**

### **2.4.1 Electrical**

2.4.1.1 The system shall be powered through USB.

### **2.4.2 Physical**

2.4.2.1 All electronic components shall be enclosed in an enclosure which shall fit within a maximum 21 cm x 16 cm x 2 cm envelope.

2.4.2.2 The system shall weigh less than 0.5 kg.

2.4.2.3 The system shall have a cable of at least 50cm.

### **2.4.3 Environmental**

2.4.3.1 The operating temperature of this system shall be 0 to 40° C.

### **2.4.4 Economic**

2.4.4.1 The system prototype must have a one-time cost of under \$500.

## **2.5 Other Requirements**

### **2.5.1 Safety**

2.5.1.1 The system shall not have any exposed conductors.

## **3 VERIFICATION OF REQUIREMENTS**

### **3.1 Item Description**

The following sections describe the necessary testing to be performed to verify that the requirements of the Input-Corrective Drawing Tablet have been met. Each test item corresponds to a requirement of an equivalent enumeration.

### **3.2 Interface Requirements**

#### **3.2.1 Physical**

3.2.1.1 Verify by observation that the drawing surface is 20 x 15 cm.

3.2.1.2 Verify that the system is easily transported.

3.2.1.3 Verify through testing that the system can function after being dropped from a height of 1 m.

#### **3.3 Functional Requirements**

3.3.1.1 Verify through observation that the input model can sense 100 levels of pressure.

3.3.1.2 Verify through observation that the input module has a resolution of 200 lines per cm.

3.3.1.3 Verify through observation that the system can be turned off by the user.

3.3.1.4 Verify through observation that the input sensitivity can be adjusted.

3.3.1.5 Verify through user testing that the stylus is comfortable to the user for at least 3 hours of use.

3.3.1.6 Verify through measurement that the input module has an accuracy of 0.5 mm.

#### **3.3.2 Processing Module**

3.3.2.1 Verify through observation that valid input is detected by the drawing pad and the invalid input is ignored.

3.3.2.2 Verify through repeated user testing that the processed input represents the user intentions.

3.3.2.3 Verify through repeated user testing that the accuracy of intended input improves after each use.

#### **3.3.3 Output Module**

3.3.3.1 Connect oscilloscope to USB ground and data bus. Insure that the oscilloscope ground is connected with the USB ground. Draw straight and lines with an arc of at least 82 degrees. Verify that signals are sent over USB.

3.3.3.2 Connect the USB cable to a desktop computer. Open third party software. Draw straight lines and lines with an arc of at least 82 degrees on the drawing pad. Verify that drawings appear on third party software.



### **3.3.4 Performance**

3.3.4.1 Connect the Input-Corrective Drawing tablet's USB cable to a desktop computer and open third party software. Draw straight lines and lines with an arc of at least 82 degrees on the drawing pad. Verify that the system takes no longer than 0.25 to render output to the monitor.

## **3.4 Non-Functional Requirements**

### **3.4.1 Electrical**

3.4.1.1 Verify through observation that the device is powered by USB.

### **3.4.2 Physical**

3.4.2.1 Verify through measurement that the system is 21 cm x 16 cm x 2 cm in diameter with an error of  $\pm 1.0$ mm.

3.4.2.2 Verify through measurement that the system weighs less than 1 kg.

3.4.2.3 Verify through measurement and observation that the system's USB cable is at least 50cm long.

### **3.4.3 Environmental**

3.4.3.1 Place the system in an environment of 0° C and an environment of 40° C. Verify that the system functions according to the defined requirements in both environments.

### **3.4.4 Economic**

3.4.4.1 Calculate the total cost of all materials, components, and services needed in the construction of the system prototype. Verify that the total cost is less than \$500.

## **3.5 Other Requirements**

### **3.5.1 Safety**

3.5.1.1 Inspect the system and verify through observation that the system encloses all conductors.

