ACCIORDING TO ERICA GOODE IN THE NEW YORK TIMES AT JANUARY 12, 1999 SHE DISCUSSES THE STRUGGLE THAT PARENTS FACE WHEN THEY TRY TO HELP THEIR KIDS TO LEARN HOW TO USE TOILETS AND CONTROL THEIR BLADDERS. THUS PARENTS HAVE TO GET A NEW CHEAP TECHNIQUE THAT CAN HELP THEM TO OVERCOME THIS DILEMMA AND TO FIND A NEW TOOL TO HELP BECOMES URGENT. THE ITOI, INTERACTIVE TOILET, IS A NEW TOOL THAT HAS THE BASIC INTERACTIVE COMPONENTS THAT HELPS KIDS TO LEARN AND FEEL HAPPY TO USE THE TOILET. ITOI IS A TOILET LID THAT CAN DETECT THE PRESENCE OF A KID WHO SIT DOWN ON IT, AND THUS INTERACT WITH THAT PRESENCE. THE INTERACTION IS OF FOUR STAGES, LED INTERACTION THAT SHOW THE STATUS, ACTION SENSORS THAT DETECTS KIDS OUTCOMES, MUSICAL RESPONSE AS AN INTERACTION FOR THE SUCCESS TO USE THE ITOI, AND THE SHAKING HANDS AND PAPER DISPENSING ARMS AS THE FINAL STAGE FOR SUCCESS. THAT’S SIMPLY THE ITOI2009!

**What are the 'ITOI' Hardware components?**

1- **Kid Toilet Lid**
2- **Presence sensor:** a distance measuring sensor unit from Sharp (Part no. GP2Y0D810Z0F) will be used.
3- “**Action**” sensors: in order to be able to detect the passing of objects through the lid, several pairs of Infrared Emitting Diodes and Photosensors.
4- **Action signals:** This arrangement of color LEDs will act as a traffic light.
5- **The Hand-Shaking Arm (HSA):** the arm that controls the HSA will be attached to a servomotor that would change its position depending on the status of the ITOI.
6- **Paper-Dispensing Arm (PDA):** this device will be controlled in a similar way to the HSA.
7- **Control Box:** As it is mentioned in the previous section, this box will contain the control box (Arduino+Motor Shield) and all the additional electronics required to make the rest of the components work. Furthermore, a music-box and the built-in speakers will be placed in this Control Box.

All these elements would be controlled by an Arduino board and a C++ code written for this purpose is described in the next page.

**ITOI Scenario: Miranda and her 2 years old daughter Linda**

1-Linda sits down on the ITOI.
2-The red LED goes on, and then the ITOI is waiting
3-When Linda use the ITOI and she deposit anything in the toilet, the yellow LED goes on to give Miranda an indication that her daughter is using the toilet now, but if

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Linda is just sitting down and she doesn't deposit anything then the red LED will still going on (telling Miranda that her daughter doesn't use the toilet yet)!
4-Then the music will start "If you happy and you know it clap your hand....."
5-The shake hands will rotate to shake hands with Linda.
6-Then the Paper-Dispensing Arm will rotate to give Linda a piece of paper.
7- Both the HSA and PDA arms will return back to their origin.
8-Finally the green LED will go on helping Miranda to know that Linda has finished.
Now Miranda is feeling better about her daughter who likes ITOI and starts to use the toilet!

//-- Declare all the IN/OUT pin variables

int Action1 = 2; // Action sensors (Digital Inputs 2-5)
int Action2 = 3;
int Action3 = 4;

int Presence = 6; // Presence sensor (Digital Input 6)
int Music = 7; // Music box (Digital Output 7)

int Red = 11; // Red LEDs (Digital Output 11)
int Yellow = 12; // Yellow LEDs (Digital Output 12)
int Green = 13; // Green LEDs (Digital Output 13)

int Paper = 9; // Paper-Dispensing Arm Servo
int Shake = 10; // Hand-Shaking Arm Servo

// Declare own variables
int Pres = 0;
int Action = 0;
int presence = 0;
int A1 = 0;
int A2 = 0;
int A3 = 0;
int Time_Paper = 0;
int Time_Shake = 0;

/**********************************************************/
//                      
//  VOID SETUP: Configure board pins                
//             / /                  
//***********************************************************/
void setup() {
    pinMode(Pres,INPUT);       // Presence Sensor: INPUT
    pinMode(Action1,INPUT);    // Action sensors: INPUT
    pinMode(Action2,INPUT);
    pinMode(Action3,INPUT);
    pinMode(Music,OUTPUT);     // Music box: OUTPUT
    pinMode(Red,OUTPUT);       // Action Signals (LEDs): OUTPUT
    pinMode(Yellow,OUTPUT);
    pinMode(Green,OUTPUT);
    pinMode(Paper,OUTPUT);     // Servomotors (Motor Shield)
    pinMode(Shake,OUTPUT);
}  // Close void setup

/**********************************************************/
//                      
//  VOID LOOP: Main program                 
//                      
/**********************************************************/
void loop() {
    digitalWrite(Red,LOW);     // Make sure all LEDs are OFF
    digitalWrite(Yellow,LOW);
    digitalWrite(Green,LOW);
}
while (presence == 0) {  // If no kid, keep updating sensor
    Pres = digitalRead(Presence); // Read from presence sensor
    if (Pres==LOW){
        presence=1;
    } else {
        presence=0;
    }  
} // Close while

digitalWrite(Red,HIGH);  // If kid detected, Red light ON
while (Action == 0) {  // If no action from kid, update sensors
    A1 = digitalRead(Action1);
    A2 = digitalRead(Action2);
    A3 = digitalRead(Action3);
    if (A1==HIGH || A2==HIGH || A3==HIGH) {
        Action = 1; // If action detected
    } // Close if
    else {
        Action = 0;
    } // Close else
} // Close while

digitalWrite(Red,LOW);  // Red light OFF
digitalWrite(Yellow,HIGH); // Yellow light ON
digitalWrite(Music,LOW); // Only pulse is required
delay(100);
digitalWrite(Music,HIGH); // Music ON
delay(100);
digitalWrite(Music,LOW); // Only pulse is required

for (Time_Shake = 0; Time_Shake <= 15; Time_Shake++) { // degrees approx.
    digitalWrite(Shake,HIGH);
    delayMicroseconds(1400); // 1.4ms CLOCKWISE
digitalWrite(Shake,LOW);
    delay(20); // 20ms
}
delay(12000); // Wait 5 seconds

// Activate Paper-Dispensing Arm (PDA)

for (Time_Paper = 0; Time_Paper <= 17; Time_Paper++) { // degrees approx.
    digitalWrite(Paper,HIGH);
    delayMicroseconds(1600); // 1.6ms COUNTER-CLOCKWISE
    digitalWrite(Paper,LOW);
    delay(20); // 20ms
}
delay(5000); // Wait 5 seconds

// Activate Hand-Shaking Arm (HSA)

digitalWrite(Yellow,LOW); // Yellow light OFF
digitalWrite(Green,HIGH); // Red light ON

// Deactivate both arms

for (Time_Paper = 0; Time_Paper <= 7; Time_Paper++) { // degrees approx.
    digitalWrite(Paper,HIGH);
    delayMicroseconds(1400); // 1.4ms CLOCKWISE
    digitalWrite(Paper,LOW);
    delay(20); // 20ms
}

// Deactivate Hand-Shaking Arm (HSA)

for (Time_Shake = 0; Time_Shake <= 7; Time_Shake++) { // degrees approx.
    digitalWrite(Shake,HIGH);
    delayMicroseconds(1600); // 1.6ms COUNTER-CLOCKWISE
    digitalWrite(Shake,LOW);
    delay(20); // 20ms
}

while (1) { // Infinite loop
    // Close while
}

} // Close void loop