**Project-3: Smart Door Security System**

**Introduction**

Security at home is a priority, and the Smart Door Security System offers an automatic method of identifying unwanted attempts to enter. Two primary sensors are utilized by the system:

* Force Sensor (positioned beneath the doormat) – Identifies pressure when stepped on.
* Tilt Sensor (positioned in the door handle) – Identifies movement or interference with the handle.

If abnormal movement or force is sensed, it triggers a buzzer alarm as well as automates the door locking using a servo motor. A 16x2 LCD display also delivers real-time status information, while a manual push button enables unlocking of the door by the owner.

**Components Used:**

**Sensors**

Force Sensor (Analog - A0) → Mounts under doormat for sensing pressure.

Tilt Sensor (Digital - Pin 2) → Placed in the door handle to sense movement.

**Actuators**

Servo Motor (Pin 6) → Operates the door lock.

Buzzer (Pin 3) → Triggers an alarm on detecting unauthorized access.

**Other Components**

Slide Switch (Pin 4, Digital Input) → Enables the owner to unlock the door manually.

16x2 LCD Display with I2C Module → Shows system status and alerts.

**Microcontroller:**

Arduino Uno

**System Functionality**

The system continually checks the tilt sensor and the force sensor for any possible dangers. Depending upon the readings given by the sensors, the system reacts as below:

**1. Authorized Unlock (Switch button)**

When the owner presses the push button, the system unbolts the door.

* The LCD shows "OWNER COMMAND - UNLOCKING.".
* In case the servo motor was in the locked condition, it makes a turn so that the door gets unlocked.

**2. Forced Attempt (Force & Tilt Detected)**

If someone steps on the doormat (force sensor triggers) and moves the handle (tilt sensor triggers):

* The buzzer alarm turns on.
* The LCD shows "ALERT! ABNORMAL MOVEMENT DETECTED".
* The servo motor locks the door to secure against unauthorized entry.

**3. Unauthorized Attempt (Force Only)**

When pressure is detected on the doormat but the handle is not moving:

* The buzzer beeps periodically as an alert.
* The LCD shows "PERSON DETECTED, NO HANDLE MOVEMENT".
* The safety lock is emulated as a precautionary step.

**4. Unauthorized Attempt (Tilt Only)**

If the handle is displaced but no force is sensed on the mat, this is eliminated as a break-in from the outside.As the door unlocking without any foot on the mat is extremely unlikely, this condition is neglected.

**5. Normal Condition (No Force or Tilt)**

If nothing out of the ordinary is sensed:

* The LCD shows "NO MOVEMENT - SAFE".
* The door is left in the same position with no modifications.

**Conclusion**

Smart Door Security System is a trusted solution to enhance home security. Using a force sensor and tilt sensor, it successfully monitors unwanted motion and locks the door automatically. With future developments, this system can be integrated with remote monitoring, biometric verification, or mobile app control, making it even more sophisticated and convenient to use.