INSTRUCTIONS -

1) Download and Install the .apk file from the Repository link provided. Please note that our Application is currently available for Android Platform only.

2) Take out a print out of the Marker provided in the Repository. Otherwise, you can also open it digitally on another Smartphone/Tablet. The Virtual Robots / Digital Twin will be displayed on top of this Marker when it will be in front of the Smartphone Camera (in which an instance of the App is running).

3) Currently, there are two modes in the Application - Monitor and Program.

4) By default, the Robotic Arm will be selected on the Menu Screen. You can either go to Monitor or Program Options by clicking on the respective Buttons.

5) In Monitor Mode, place the Marker on a Level Surface and point your smartphone camera towards it. The Virtual Model of Robotic Arm should now appear on top of it. The arm will now move according to the movement of the real arm. Please note that this feature will only work when the Actual Robotic Arm is connected to the Server and is made to move by feeding commands on the server.

* Since this part needs the presence of the Actual Arm, you would have to refer to a video we have put up regarding the same.

6) In Program Mode, place the Marker on a Level Surface and point your smartphone camera towards it. The Virtual Model of Robotic Arm should now appear on top of it. Next, you feed the commands in the Text box in the Smartphone. The Syntax of the Commands is as follows -

0 -> First Servo ; 1 -> Second Servo ; 2 -> Third Servo

Examples -

**0S120;** - Moves the first servo motor to an angle of 120 degrees

**0S45;2S150;**- Moves the first servo motor to an angle of 45 degrees and then moves the third servo to an angle of 150 degrees

**L(1S30;1S60;)** - Moves the second servo motor to an angle of 30 degrees and then moves it to an angle of 60 degrees in a loop. To Stop the Loop, press the Stop Button which will then be displayed on the Screen.

* Please note that the angle values are absolute and not relative to the previous position of servo. A servo motor can rotate only from an angle of 0 degrees to 180 degrees. Any commands given outside this range will be trimmed appropriately
* The user can enter any number of commands in the proper syntax. All of them will be executed one after the other.

7) After typing the Appropriate Commands, the User can press two buttons - Visualise or Send. Visualise will make the Virtual Arm move according to the Commands provided. Send will push the commands to the Actual Robot through the Server, provided the Actual Robot is connected to the Server. The Status of connection of the App with the Serve is displayed on the top part of the Screen.

* Please note that this does not tell whether the Actual Robot is Online or not. If it is active the top part of the screen will show the Servo Rotation angles of the Three servos.
* The aim of “Visualise” button is for the user to check the effect of Commands provided in the Virtual Arm.The Virtual Arm needs to be placed in the Real world environment so as to analyse whether the Actual Arm will not break anything in the Real World Scene.

8) As an additional feature, to highlight the versatility and scalability of our system, we have added a Lathe Machine for demonstration. To access it, Click the right arrow button on the Menu Screen besides the Robotic Arm. The Lathe Machine model should be visible now. Click on the Program button to control the Virtual Lathe Machine.

9) In Program Mode, place the Marker on a Level Surface and point your smartphone camera towards it. The Virtual Model of Lathe Machine should now appear on top of it. Next, you feed the commands in the Text box in the Smartphone. The Syntax of the Commands is as follows -

Examples-

**M12;** - Moves the stage towards the jaw by a distance which is proportional to 12. The maximum value that can accompany M is 18 and the minimum value is 0.

**R250;** - Rotates the jaw by an RPM which is a factor of 250. The minimum value that can accompany R is 0 and the more the given value is, the faster the jaw will rotate.

* The user can enter any number of commands in the proper syntax. All of them will be executed one after the other.