Visvesvaraya National Institute of Technology (VNIT), Nagpur

Embedded Systems (ECL403)

ENDSEM REPORT

Submitted by :

Chavva Teja Venkata Ratna Sai Kumar(BT20ECE020)
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Submitted to :
Dr. Ankit A. Bhurane
(Course Instructor)
Department of Electronics and Communication Engineering,
VNIT Nagpur

Aim: Designing an ATM Machine in which user can able to login using username and password, displaying all the transaction details on the google spreadsheet using ESP32.

Requirements: ESP32, Arduino IDE, Google sheets, Telegram Bot.

Concept: We have to design an ATM machine in which user is able to login the system using username and password as credentials. We have given that Fifteen Thousand Only (15000). After successful verification of the credentials, user can able to credit/debit in the multiples of hundreds. After the transactions these history to be stored in the google spreadsheet like opening balance, debit/credit transactions, current balance.

Code:

```
//Importing the necessary libraries.
// Library used for connecting the wifi securely to the esp32 kit.
#include <WiFi.h>
#include <WiFiClientSecure.h>

//Connecting the TelegramBot with the esp32 kit.
#include <UniversalTelegramBot.h>
#include <ArduinoJson.h>
// Inorder to send the html request for fetching or posting the ...
    data from or into the google sheets.
#include <HTTPClient.h>

// These are the cells with username,password,totalamount at ...
    initial stages.
const char*cellAddress1 = "A1";
const char*cellAddress2 = "B1";
const char*cellAddress3 = "D2";
// Inorder to check whether the user is verified or not.
int User_Verified = 0;
// WI-FI will help us to connect the outer world.
const char* ssid_name = "ESP32";
const char* password = "Acharya_Teja123";

//Bot has been created from the telegram using BotFather.
// Inorder to access that bot we are using these credentials.
#define BOTtoken "5675384134:AAEFt79mx2sS9XoC0FNwkblwHGyFC75-sn4"
#define CHAT_ID "1245117506"

// Google script ID and required credentials
String GOOGLESCRIPT_ID1 = ...
    "AKfycbyqvXnUtfN594wXWoSgRo7G1IAX7xIJk6vrYqibPQMuJDmqVUbgAfIXkcXahg9Yyo_WVg";
```

```
29 WiFiClientSecure client;
30 UniversalTelegramBot bot(BOTtoken, client);
31 // Getting checked the messages for every 1 second.
32 int botDelay = 1000;
33 int username_status=0,password_status=0;
34 unsigned long lastTimeBotRan;
35
36 // details of the account.
37 String username_from_bot,password_from_bot;
38 int credit_status=0,debit_status=0,creditNotes,debitNotes;
39 String username_from_sheet,password_from_sheet;
40 int no_of_notes;
41 int password_update=0,username_update=0;
42 String updatedPassword;
43
44 // Handle what happens when you receive new messages
45 String handleNewMessages(int numNewMessages) {
46   Serial.println(String(numNewMessages));
47   for (int i=0; i<numNewMessages; i++) {
48     // Chat id of the requester
49     String chat_id = String(bot.messages[i].chat_id);
50     if (chat_id != CHAT_ID){
51       bot.sendMessage(chat_id, "Unauthorized user", "");
52       continue;
53     }
54     // text of the message entered.
55     String msg = bot.messages[i].text;
56     // this becomes activate when user is asked to type the ...
         username.
57     if (username_status==1){
58       username_from_bot = msg;
59       Serial.print("Entered Username from bot: ");
60       Serial.println(username_from_bot);
61       username_status=0;
62     }
63     // this becomes activate when user is asked to type the ...
         password.
64     if (password_status==1){
65       password_from_bot = msg;
66       Serial.print("Entered Password from bot: ");
67       Serial.println(password_from_bot);
68       password_status = 0;
69     }
70     // if user is crediting the money into the bank account it ...
         activates.
71     if (credit_status==1){
72       creditNotes = msg.toInt();
73       credit_status=0;
74       no_of_notes = no_of_notes + creditNotes;
```

```
75        //sends the message that money has been credited.
76        bot.sendMessage(chat_id,"Dear Customer, Your a/c with ...
              username "+username_from_bot+"
77        Credited by Rs."+String(creditNotes*100),"");
78        //sends the message of final balance in  the bank account.
79        bot.sendMessage(chat_id,"Dear Customer, Your a/c with ...
              username "+username_from_bot+" , Aval.Balance= ...
              "+String(no_of_notes*100),"");
80        //updating the transaction details in the spreadsheet.
81        String urlFinal4 = "https://script.google.com/macros/s/"+
82        GOOGLESCRIPT_ID1+"/exec?
83        transaction="+String(creditNotes*100)+
84        "&balance="+String(no_of_notes*100);
85        Serial.print("Posting data to the spreadsheet");
86        HTTPClient http;
87        http.begin (urlFinal4.c_str () );
88        http.setFollowRedirects (HTTPC_STRICT_FOLLOW_REDIRECTS) ;
89        int httpCode4 = http.GET () ;
90        Serial.println(httpCode4);
91        //ending the http request.
92        http.end();
93        //updating the final balance or total amount in the ...
              spreadsheet.
94        String urlFinal6 = ...
              "https://script.google.com/macros/s/"+GOOGLESCRIPT_ID1+"/exec?
95        finalbalance="+String(no_of_notes*100);
96        Serial.print("Posting data to the spreadsheet");
97        http.begin (urlFinal6.c_str () );
98        http.setFollowRedirects (HTTPC_STRICT_FOLLOW_REDIRECTS) ;
99        int httpCode6 = http.GET () ;
100       Serial.println(httpCode6);
101       //ending the http request
102       http.end();
103     }
104     // it becomes activate when you are doing withdrawl of money.
105     if (debit_status==1){
106       debitNotes = msg.toInt();
107       debit_status=0;
108       if (debitNotes>no_of_notes){
109         // as money is not sufficient it was not able to perform ...
                the action.
110         bot.sendMessage(chat_id,"Insuffienct Balance.","");
111       }
112       else{
113
114         no_of_notes = no_of_notes -debitNotes;
115         bot.sendMessage(chat_id,"Dear Customer, Your a/c with ...
              username "+username_from_bot+" debited by ...
              Rs."+String(debitNotes*100),"");
```

```
116           bot.sendMessage(chat_id,"Dear Customer, Your a/c with ...
                  username "+username_from_bot+" , Aval.Balance= ...
                  "+String(no_of_notes*100),"");
117           // updating the transactions in the google spreadsheet.
118           String urlFinal5 = "https://script.google.com/macros/s/"+
119           GOOGLESCRIPT_ID1+"/exec?transaction="+
120           String(debitNotes*-100)+"&balance="+String(no_of_notes*100);
121           Serial.print("Posting data to the spreadsheet");
122           HTTPClient http;
123           http.begin (urlFinal5.c_str () );
124           http.setFollowRedirects (HTTPC_STRICT_FOLLOW_REDIRECTS) ;
125           int httpCode5 = http.GET () ;
126           Serial.println(httpCode5);
127           //ending the http request.
128           http.end();
129           // updating the final balance or total amount in the amount.
130           String urlFinal7 = "https://script.google.com/macros/s/"+
131           GOOGLESCRIPT_ID1+"/exec?finalbalance="+
132           String(no_of_notes*100);
133           Serial.print("Posting data to the spreadsheet");
134           http.begin (urlFinal7.c_str () );
135           http.setFollowRedirects (HTTPC_STRICT_FOLLOW_REDIRECTS) ;
136           int httpCode7 = http.GET () ;
137           Serial.println(httpCode7);
138           // ending the http request.
139           http.end();
140         }
141       }
142       // get activated when user wants to update the password.
143       if (password_update==1){
144         updatedPassword = msg;
145         password_update=0;
146         // getting updated password posted in the google spreadsheet.
147         String urlFinal8 = ...
                "https://script.google.com/macros/s/"+GOOGLESCRIPT_ID1+"/exec?
148         passwordUpdate="+updatedPassword;
149         Serial.print("Posting data to the spreadsheet");
150         HTTPClient http;
151         http.begin (urlFinal8.c_str () );
152         http.setFollowRedirects (HTTPC_STRICT_FOLLOW_REDIRECTS) ;
153         int httpCode8 = http.GET () ;
154         Serial.println(httpCode8);
155         //ending the request.
156         http.end();
157         bot.sendMessage(chat_id,"Password is updated Successfully!!");
158         User_Verified = 0;
159         digitalWrite(2,LOW);
160       }
161       String from_name = bot.messages[i].from_name;
```

```
162       // basic one,.
163       if (msg == "/start") {
164         String welcome = "Welcome, " + from_name + ".\n";
165         welcome += "Use the following commands to control your ...
              outputs.\n\n";
166         welcome += "/username inorder to verify the username through ...
              input\n";
167         welcome += "/password inorder to verify the password through ...
              input\n";
168         welcome += "/login inorder to verify the credentials. \n";
169         bot.sendMessage(chat_id, welcome, "");
170       }
171       if (msg == "/username") {
172         bot.sendMessage(chat_id, "Enter the username", "");
173         username_status = 1;
174       }
175       if (msg == "/password") {
176         bot.sendMessage(chat_id, "Enter the password", "");
177         password_status = 1;
178       }
179
180       if (msg =="/login"){
181         bot.sendMessage(chat_id,"Verifying the Credentials","");
182         if (User_Verified==1){
183           bot.sendMessage(chat_id,"You have already Logged into your ...
                account","");
184           continue;
185         }
186         if (username_from_sheet==username_from_bot && ...
              password_from_sheet==password_from_bot){
187         digitalWrite(2,HIGH);
188         User_Verified = 1;
189         String message = "Congratulations!! " + from_name + ".\n";
190         message += "You have Successfully logged into your bank ...
              account\n";
191         message += "/checkBalance inorder to find the balance of ...
              the bank account\n";
192         message += "/credit inorder to credit the money into your ...
              bank account\n";
193         message += "/debit inorder to debit the money from your ...
              bank account\n";
194         message += "/updatePassword In order to change the ...
              password of the bank account\n";
195         message += "/logout inorder to logout from the bank ...
              account. \n";
196         bot.sendMessage(chat_id,message,"");
197         }
198         else{
```

```
199           bot.sendMessage(chat_id,"Sorry! Entered Credentials are ...
                  wrong. Re-Enter Correctly");
200         }
201       }
202       if (msg == "/logout"){
203         if (User_Verified==1){
204           User_Verified = 0;
205           digitalWrite(2,LOW);
206           String message2 = "You have Successfully logged out from ...
                  the bank account";
207           bot.sendMessage(chat_id,message2,"");
208         }
209         else{
210           bot.sendMessage(chat_id,"First Login to your account ...
                  inorder to logout","");
211         }
212       }
213       if (msg=="/checkBalance"){
214         if (User_Verified==1){
215           bot.sendMessage(chat_id,"Dear Customer, Your a/c with ...
                  username "+username_from_bot+" , Aval.Balance= ...
                  "+String(no_of_notes*100),"");
216         }
217         else{
218           bot.sendMessage(chat_id,"Enter to your bank account using ...
                  valid credentials inorder to perform any action.","");
219         }
220       }
221       if (msg=="/credit"){
222         if (User_Verified==1){
223           bot.sendMessage(chat_id,"Enter the number of 100 rupee ...
                  notes you wanna credit
224           from the bank account: ","");
225           credit_status=1;
226         }
227         else{
228           bot.sendMessage(chat_id,"Enter to your bank account using ...
                  valid credentials inorder to perform any action.","");
229         }
230       }
231       if (msg =="/debit"){
232         if (User_Verified==1){
233           bot.sendMessage(chat_id,"Enter the number of 100 rupees ...
                  notes you wanna debit
234           from the bank account: ","");
235           debit_status = 1;
236         }
237         else{
```

```
238           bot.sendMessage(chat_id,"Enter to your bank account using ...
                  valid credentials inorder to perform any action.","");
239         }
240       }
241       if (msg == "/updatePassword"){
242         if (User_Verified==1){
243           bot.sendMessage(chat_id,"Enter the new password to which ...
                  you wanna update: ","");
244           password_update=1;
245         }
246       }
247     }
248   }
249   void setup() {
250     pinMode(2,OUTPUT);
251     Serial.begin(115200);
252     // Connect to Wi-Fi
253     WiFi.mode(WIFI_STA);
254     WiFi.begin(ssid_name, password);
255     client.setCACert(TELEGRAM_CERTIFICATE_ROOT); // Add root ...
          certificate for api.telegram.org
256     while (WiFi.status() != WL_CONNECTED) {
257       delay(1000);
258       Serial.println("Connecting to WiFi..");
259     }
260     // Print ESP32 Local IP Address
261     Serial.println(WiFi.localIP());
262     if (WiFi.status()==WL_CONNECTED){
263       String urlFinal1 = ...
              "https://script.google.com/macros/s/"+GOOGLESCRIPT_ID1+"/exec?read="+
264       cellAddress1;
265       String urlFinal2 = ...
              "https://script.google.com/macros/s/"+GOOGLESCRIPT_ID1+"/exec?read="+
266       cellAddress2;
267       String urlFinal3 = ...
              "https://script.google.com/macros/s/"+GOOGLESCRIPT_ID1+"/exec?read="+
268       cellAddress3;
269       Serial.println("Credentials");
270       delay(1000);
271       HTTPClient http;
272       http.begin (urlFinal1.c_str () );
273       delay(1000);
274       http.setFollowRedirects (HTTPC_STRICT_FOLLOW_REDIRECTS) ;
275       int httpCode1 = http.GET () ;
276       if (httpCode1 >0){
277         username_from_sheet = http.getString();
278         Serial.println(httpCode1);
279         Serial.println(username_from_sheet);
280       }
```

```
281       else{
282         Serial.println("ERROR ON THE REQUEST");
283       }
284       http.end();
285       http.begin (urlFinal2.c_str ());
286       delay(1000);
287       http.setFollowRedirects (HTTPC_STRICT_FOLLOW_REDIRECTS) ;
288       int httpCode2 = http.GET () ;
289       String payload2;
290       if (httpCode2 >0){
291         password_from_sheet = http.getString();
292         Serial.println(httpCode2);
293         Serial.println(password_from_sheet);
294       }
295       else{
296         Serial.println("ERROR ON THE REQUEST");
297       }
298       http.end();
299       http.begin (urlFinal3.c_str ());
300       delay(1000);
301       http.setFollowRedirects (HTTPC_STRICT_FOLLOW_REDIRECTS) ;
302       int httpCode3 = http.GET () ;
303       if (httpCode3 >0){
304         String balance = http.getString();
305         Serial.println(httpCode3);
306         no_of_notes = balance.toInt()/100;
307         Serial.println(no_of_notes);
308       }
309       else{
310         Serial.println("ERROR ON THE REQUEST");
311       }
312       http.end();
313     }
314   }
315   void loop() {
316     if (WiFi.status () == WL_CONNECTED) {
317       if (millis() > lastTimeBotRan + botDelay)  {
318       int numNewMessages = bot.getUpdates(bot.last_message_received ...
              + 1);
319       while(numNewMessages) {
320         handleNewMessages(numNewMessages);
321         numNewMessages = bot.getUpdates(bot.last_message_received + ...
                1);
322       }
323       lastTimeBotRan = millis();
324     }
325     }
326
327   }
```

App Script Code:

```
var sheet_id = "1-JCss_sKPSfB8c3lfuG2ZU8Tj67szyzoh_WOvriT1OE";
var sheet_name1 = "credentials";
var sheet_name2 = "Transactions";
var ss = SpreadsheetApp.openById(sheet_id);
var sheet1 = ss.getSheetByName(sheet_name1);
var sheet2 = ss.getSheetByName(sheet_name2);

function doGet(e){
  // for getting details of the credit,debit,mini statement.
  if (e.parameter.transaction){
    var data1 = Number(e.parameter.transaction);
    var data2 = Number(e.parameter.balance);
    if (data1>0){
      sheet2.appendRow([data2-data1,data1,data2,"CREDITED"+String(data1)]);
    }
    else if (data1==0){
      sheet2.appendRow([data2,data1,data2,"NO ACTION PERFORMED"]);
    }
    else{
      sheet2.appendRow([data2-data1,data1,data2,"DEBITED"+String(data2)]);
    }

    return;
  }
  if (e.parameter.passwordUpdate){  // password update.
    var data4 = e.parameter.passwordUpdate;
    sheet1.getRange("B1").setValue(data4);
    return;
  }
  if (e.parameter.finalbalance){  // final balance update.
    var data3 = Number(e.parameter.finalbalance);
    var getblock = sheet1.getRange("D2");
    getblock.setValue(Number(data3));
    sheet2.getRange("H2").setValue(Number(data3));
    return;
  }
  if (e.parameter.read){  // fetching the username, password, ...
      balance.
    var read = e.parameter.read;
    return ...
        ContentService.createTextOutput(sheet1.getRange(read).getValue());

  }
}
```

Procedure:

1. Connect the Arduino IDE and ESP32 using a USB Cable.
2. Write the suitable code in the IDE and burn into the ESP32.
3. Write the App Script in order to fetch the details and post the details from or into the spreadsheet.
4. Now connect the IDE to the telegram bot and display valid message according to the message given.
5. Connect the code to better Wi-fi.
6. Observe the output in the spreadsheet.

Results and Conclusion: We have successfully inter connected the google spreadsheet and Arduino IDE. Interfacing is done with telegram bot in order to give user the better experience.

Figure 1: Start command for all actions

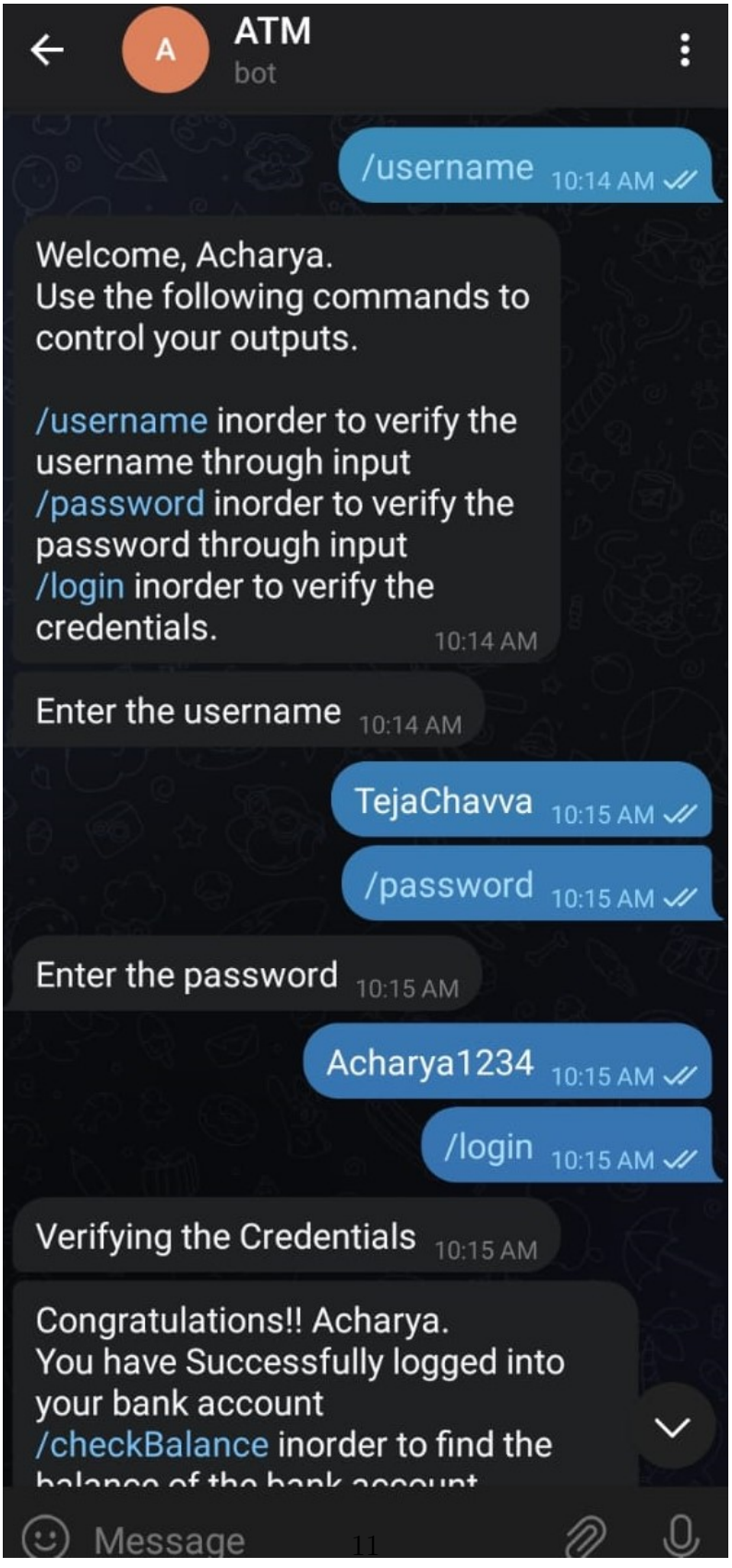

Figure 2: Login into the bank system

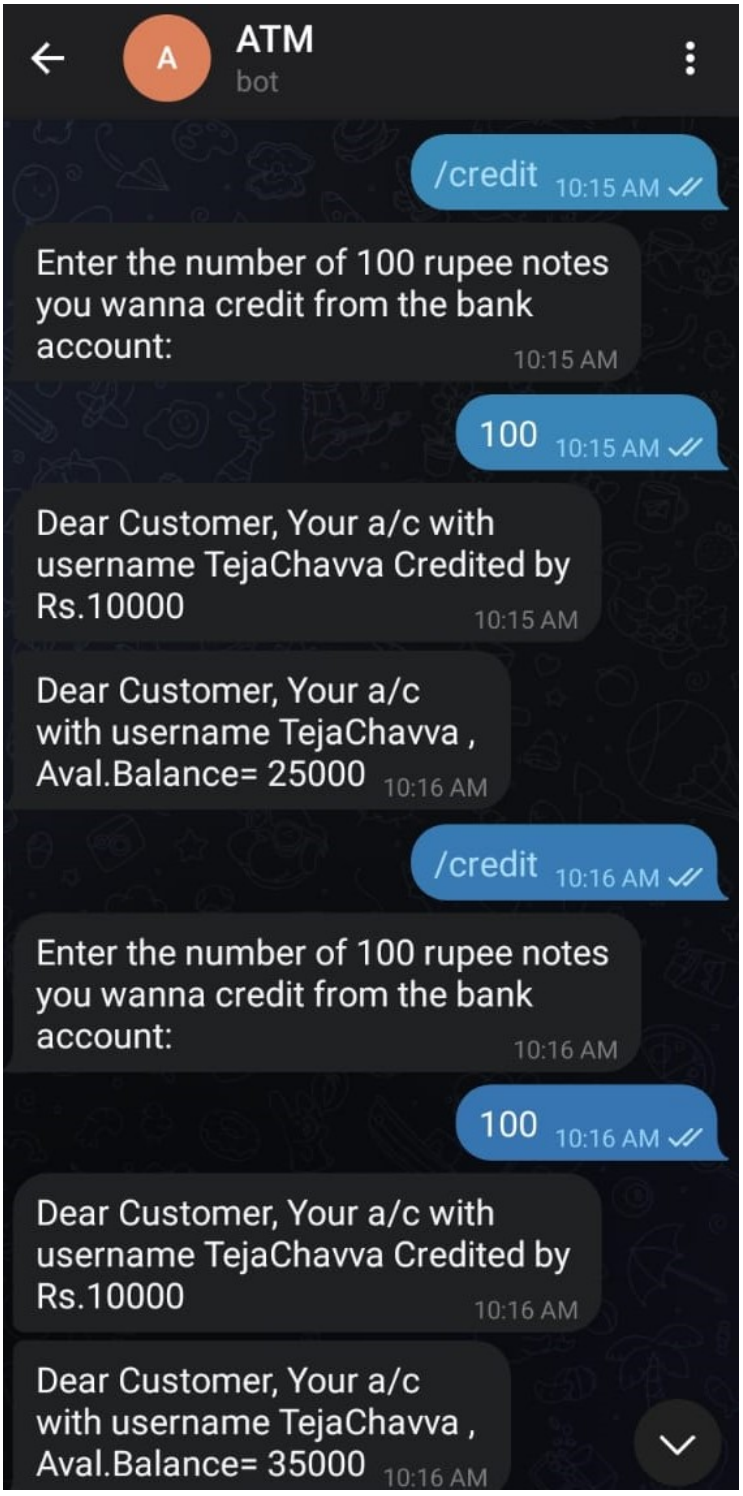

Figure 3: Crediting the money into the bank account.

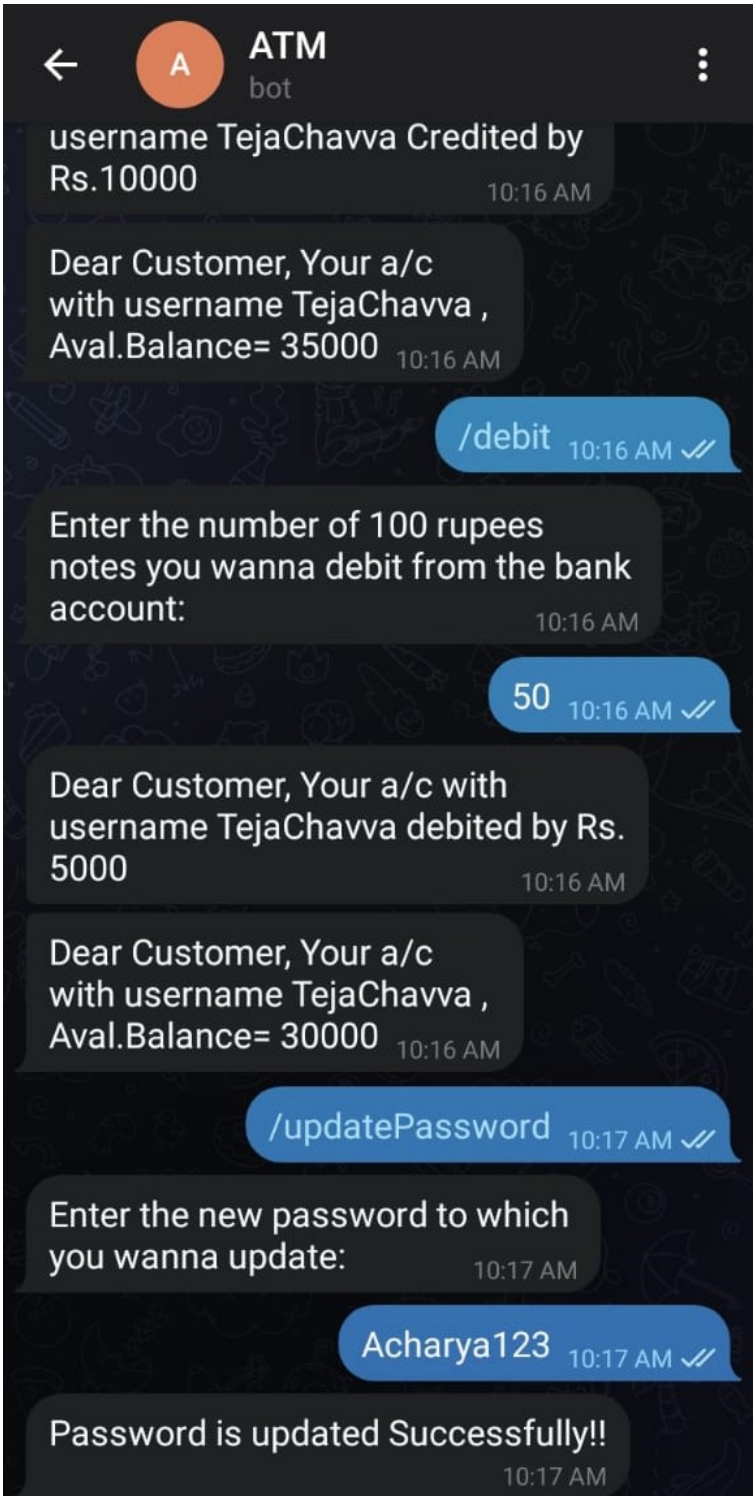

Figure 4: Debiting the money and Update Password(only valid when user is logged in).

	A	B	C	D	E
1	TejaChavva	Acharya123		**Total Balance**	
2				**30000**	
3					

Figure 5: Username,Password

	A	B	C	D	E	F	G	H
1	**Opening Balance**	**Transaction**	**Closing/Avail.Balance**	**MINI_STATEMENT**				
2							**TotalBalance**	**30000**
3	15000	10000	25000	CREDITED10000				
4	25000	10000	35000	CREDITED10000				
5	35000	-5000	30000	DEBITED30000				
6								

Figure 6: Summary of Opening Balance, Credit/Debit transactions, Closing Balance