

Digital fuel level indicator in two-wheeler along with distance to zero indicator

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Abstract : Today in this digitized world, if the fuel indicator in the automobiles is also made digital it will help to know the exact amount of fuel available in the fuel tank. The above furnished fact is considered in our project and we found out a proper solution for indicating the exact availability of fuel in the tank digitally. Here, we are indicating the amount of fuel in the tank in litres. This value in litres will be in numerical digits (ex:1.2, 1.3, 1.4). This project mainly concentrates about the indication of fuel level in two-wheeler tanks. Various other features like the distance can be travelled to the corresponding fuel, is added with this arrangement which will explain the clear performance of the vehicle to the corresponding fuel.

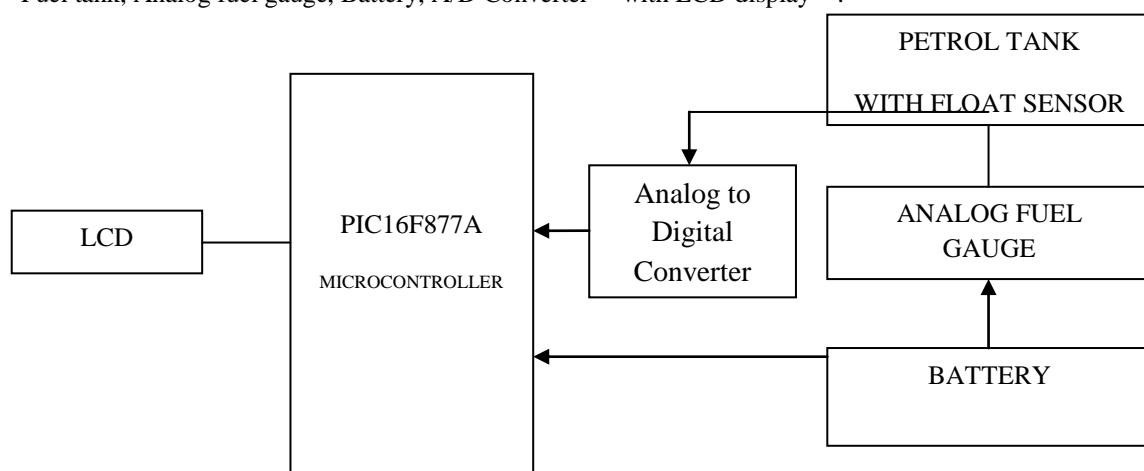
Keywords : A/D Converter, Analog fuel gauge, Mileage, Two-wheeler.

I. INTRODUCTION

The analog fuel gauge has two main units, namely the sending unit and the gauge. Here, when the fuel tank is full, resistance values decrease, current value increases and when the tank is empty, resistance values increase and current value decreases^[1]. The rear side of the analog fuel gauge has three terminals, namely B-battery, F-float, G-ground. From these terminals, voltage values are taken from the terminals-FG and resistance value is taken from the terminal-F from zero to 11 litres. So, for a particular volt value, the corresponding litres value will be shown in digital^[2]. Along with this, fuel mileage is also displayed in A/D Converter to the corresponding fuel in the fuel tank. Fuel mileage in vehicles refers to the relationship between the distances can be travelled by an automobile to the amount of fuel in the fuel tank^[3].

II. PROPOSED SOLUTION

This project focuses on creating a device which can help to actively display the exact amount of fuel and fuel mileage^[4] of a motorbike in real time. It involves the making of the system to provide a mileage indicator which is reliable, easy to read and of dependable/compatible overall design. The system comprises of Fuel tank, Analog fuel gauge, Battery, A/D Converter^[5] with LCD display^[6].



III. COMPONENTS

Pic 16F877A Microcontroller

It is an 14-bit words microcontroller and has 8KB of Flash programmable and erasable read only memory. It has an operating frequency of DC-20Mhz.

LCD

LCD (Liquid Crystal Display) screen is an electronic display module and finds a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments.

Analog fuel gauge

It is a device which shows the amount of petrol in petrol tank .(EMPTY , HALF , FULL) .
It is used in most of the two-wheelers.

Petrol Tank with Float

It is used to store petrol in two-wheelers. Float is an object which sinks over the petrol inside the petrol tank to measure the amount of petrol left in the tank.

A/D Converter

It is a device which converts analog value into digital value.

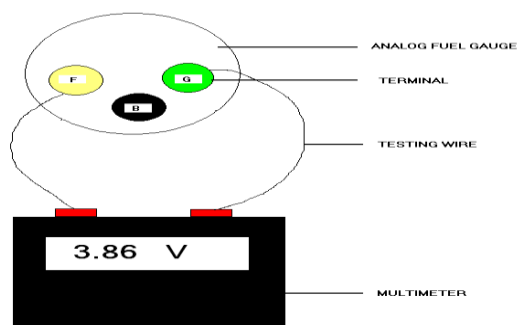
Battery

A 12 volt 7Ah battery is used to give supply to Analog fuel gauge , A/D converter along with LCD.

IV. EXPERIMENTATION METHOD

The rear side of the analog fuel gauge ^[7] has three terminals, namely F, G and B. From these terminals, we had taken terminals-FG as constant and collected the voltage values from those terminals to the corresponding litres in the petrol tank. By removing the terminal-F separately from the setup, we had taken resistance values from that terminal, to the corresponding litres in the petrol tank. The volt and resistance values was taken with the help of multi-meter. The current is obtained by using the formula, $I = V/R$.

Rear view of analog fuel gauge connected with multi meter to measure potentials at different fuel levels of tank as in figure



- F - Float
- G - Ground
- B - Battery

Mileage obtained at various speed intervals

Here the mileage value is taken for 1 litre of petrol and the distance travelled ^[8] corresponding to it is tabulated below at various speed intervals.

SPEED (km/hr)	MILEAGE OBTAINED (km/lt)	
	SINGLE PERSON LOAD	DOUBLE PERSON LOAD
10	51	48
20	54	51
30	56	53
40	60	57
50	58	55
60	56	53
70	50	46
80	44	41
90	28	25

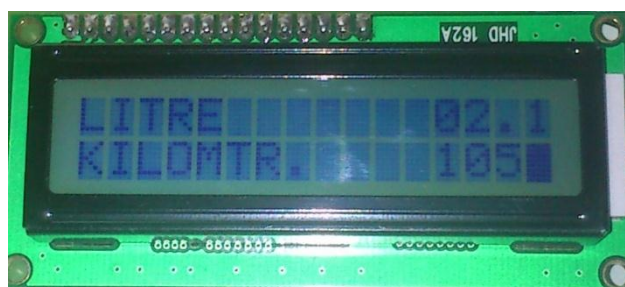
So , the average mileage for both single person and double person load will be around **50 (km/ltr)**.

V. Description

In our project the main blocks are micro controller unit, fuel level sensor and LCD display unit. The fuel level detection circuit is used to detect the level of the fuel in the tank; here sensors are placed at certain place to find out the fuel level and the signal is sent to the micro controller unit for further operations.

Here sensor is placed at fuel tank to sense the fuel level and the signal from that sensor is sent to the micro controller unit to decide the exact level [9] information. When the fuel level reaches the top level sensor which means that the tank is full and this will be indicated to the user by means of maximum tank level and the level information is indicated through LCD.

The LCD connected with vehicle which showing the present fuel level as 2.1 litres and the distance can be travelled as 105 Kilometer.



Most of the basic display unit will indicate empty, half, full with analog display [9] but the market available digital display units were displays the information in terms of percentage but our proposed method will displayed in terms of exact fuel level and these information are preprogrammed according to the sensor positional values(Resistance-Voltage). The proposed technique can be improved by adding a buzzer to announce the user about the abnormal conditions like low level, half level and full levels of the fuel tank.

In this project a float type sensor is placed within the fuel tank the variation of the fuel can change the position of variable resistance which is connected with the float. The varied resistance can change the voltage of the analog fuel level indicator to show the approximate value. But the variable resistance from the fuel tank is connected with the analog to digital converter unit to show the exact quantity of fuel in the fuel tank. The setup can show the exact value of fuel in the connected LCD and the setup is programmed to show the distance to zero by considering the rough mileage as 50kmpl. The distance to zero can also be an accurate by programming the microcontroller by taking the input of present mileage with respective speeds and tank levels.

Voltage, Resistance, Current and Distance to zero for various fuel levels is tabulated below ,

FUEL TANK (litres)	TERMINAL-F		DIGITS (Volts)	ESISTANC VALUES IN (ohms)	CURRENT OBTAIN (amps)	DISTANC TO ZERO (KM)
	MIN (volts)	MAX (volts)				
<1.0	3.82	4.00	3.83 to 3.82	<89.5	< 0.0425	< 50
1.0	3.81	4.00	3.81	89.5	0.0425	50
1.1	3.79	4.00	3.80 to 3.79	88.26	0.0430	55
1.2	3.77	4.00	3.78 to 3.77	87.02	0.0434	60
1.3	3.75	4.00	3.76 to 3.75	85.78	0.0438	65
1.4	3.73	4.00	3.74 to 3.73	84.54	0.0442	70
1.5	3.71	4.00	3.72 to 3.71	83.3	0.0446	75
1.6	3.69	4.00	3.70 to 3.69	82.06	0.0450	80
1.7	3.67	4.00	3.68 to 3.67	80.82	0.0455	85
1.8	3.65	4.00	3.66 to 3.65	79.58	0.0459	90
1.9	3.63	4.00	3.64 to 3.63	78.34	0.0464	95
2.0	3.61	4.00	3.62 to 3.61	77.1	0.0469	100
2.1	3.59	4.00	3.60 to 3.59	75.97	0.0473	105
2.2	3.57	4.00	3.58 to 3.57	74.84	0.0478	110
2.3	3.55	4.00	3.56 to 3.55	73.71	0.0482	115
2.4	3.53	4.00	3.54 to 3.53	72.58	0.0487	120
2.5	3.51	4.00	3.52 to 3.51	71.45	0.0492	125
2.6	3.49	4.00	3.50 to 3.49	70.32	0.0497	130
2.7	3.47	4.00	3.48 to 3.47	69.19	0.0502	135
2.8	3.45	4.00	3.46 to 3.45	68.06	0.0508	140

FUEL TANK (litres)	TERMINAL-F		DIGITS (Volts)	ESISTANC VALUES IN (ohms)	CURRENT OBTAIN (amps)	DISTANC TO ZERO (KM)
	MIN (volts)	MAX (volts)				
6.0	2.81	4.00	(2.82 to 2.81)	38.5	0.0732	300
6.1	2.79	4.00	(2.80 to 2.79)	37.8	0.0740	305
6.2	2.77	4.00	(2.78 to 2.77)	37.1	0.0749	310
6.3	2.75	4.00	(2.76 to 2.75)	36.4	0.0758	315
6.4	2.73	4.00	(2.74 to 2.73)	35.7	0.0767	320
6.5	2.71	4.00	(2.72 to 2.71)	35	0.0777	325
6.6	2.69	4.00	(2.70 to 2.69)	34.3	0.0787	330
6.7	2.67	4.00	(2.68 to 2.67)	33.6	0.0797	335
6.8	2.65	4.00	(2.66 to 2.65)	32.9	0.0808	340
6.9	2.63	4.00	(2.64 to 2.63)	32.2	0.0819	345
7.0	2.61	4.00	(2.62 to 2.61)	31.5	0.0831	350
7.1	2.59	4.00	(2.60 to 2.59)	30.91	0.0841	355

Digital fuel level indicator in two-wheeler along with distance to zero indicator

2.9	3.43	4.00	3.44 to 3.43	66.93	0.0513	145
3.0	3.41	4.00	3.42 to 3.41	65.8	0.0519	150
3.1	3.39	4.00	3.40 to 3.39	64.78	0.0524	155
3.2	3.37	4.00	3.38 to 3.37	63.76	0.0530	160
3.3	3.35	4.00	3.36 to 3.35	62.74	0.0535	165
3.4	3.33	4.00	3.34 to 3.33	61.72	0.0541	170
3.5	3.31	4.00	3.32 to 3.31	60.7	0.0546	175
3.6	3.29	4.00	3.30 to 3.29	59.68	0.0552	180
3.7	3.27	4.00	3.28 to 3.27	58.66	0.0559	185
3.8	3.25	4.00	3.26 to 3.25	57.64	0.0565	190
3.9	3.23	4.00	3.24 to 3.23	56.62	0.0572	195
4.0	3.21	4.00	3.22 to 3.21	55.6	0.0579	200
4.1	3.19	4.00	3.20 to 3.19	54.69	0.0585	205
4.2	3.17	4.00	3.18 to 3.17	53.78	0.0591	210
4.3	3.15	4.00	3.16 to 3.15	52.87	0.0597	215
4.4	3.13	4.00	3.14 to 3.13	51.96	0.0604	220
4.5	3.11	4.00	3.12 to 3.11	51.05	0.0611	225
4.6	3.09	4.00	3.10 to 3.09	50.14	0.0618	230
4.7	3.07	4.00	3.08 to 3.07	49.23	0.0625	235
4.8	3.05	4.00	3.06 to 3.05	48.32	0.0633	240
4.9	3.03	4.00	3.04 to 3.03	47.41	0.0641	245
5.0	3.01	4.00	3.02 to 3.01	46.5	0.0649	250
5.1	2.99	4.00	(3.00 to 2.99)	45.7	0.0656	255
5.2	2.97	4.00	(2.98 to 2.97)	44.9	0.0663	260
5.3	2.95	4.00	(2.96 to 2.95)	44.1	0.0671	265
5.4	2.93	4.00	(2.94 to 2.93)	43.3	0.0678	270
5.5	2.91	4.00	(2.92 to 2.91)	42.5	0.0687	275
5.6	2.89	4.00	(2.90 to 2.89)	41.7	0.0695	280
5.7	2.87	4.00	(2.88 to 2.87)	40.9	0.0704	285
5.8	2.85	4.00	(2.86 to 2.85)	40.1	0.0713	290
5.9	2.83	4.00	(2.84 to 2.83)	39.3	0.0722	295

7.2	2.57	4.00	(2.58 to 2.57)	30.32	0.0850	360
7.3	2.55	4.00	(2.56 to 2.55)	29.73	0.0861	365
7.4	2.53	4.00	(2.54 to 2.53)	29.14	0.0871	370
7.5	2.51	4.00	(2.52 to 2.51)	28.55	0.0882	375
7.6	2.49	4.00	(2.50 to 2.49)	27.96	0.0894	380
7.7	2.47	4.00	(2.48 to 2.47)	27.37	0.0906	385
7.8	2.45	4.00	(2.46 to 2.45)	26.78	0.0918	390
7.9	2.43	4.00	(2.44 to 2.43)	26.19	0.0931	395
8.0	2.41	4.00	(2.42 to 2.41)	25.6	0.0945	400
8.1	2.39	4.00	(2.40 to 2.39)	25.12	0.0955	405
8.2	2.37	4.00	(2.38 to 2.37)	24.64	0.0965	410
8.3	2.35	4.00	(2.36 to 2.35)	24.16	0.0976	415
8.4	2.33	4.00	(2.34 to 2.33)	23.68	0.0988	420
8.5	2.31	4.00	(2.32 to 2.31)	23.2	0.1	425
8.6	2.29	4.00	(2.30 to 2.29)	22.72	0.1012	430
8.7	2.27	4.00	(2.28 to 2.27)	22.24	0.1025	435
8.8	2.25	4.00	(2.26 to 2.25)	21.76	0.1038	440
8.9	2.23	4.00	(2.24 to 2.23)	21.28	0.1052	445
9.0	2.21	4.00	(2.22 to 2.21)	20.8	0.1067	450
9.1	2.19	4.00	(2.20 to 2.19)	20.43	0.1076	455
9.2	2.17	4.00	(2.18 to 2.17)	20.06	0.1086	460
9.3	2.15	4.00	(2.16 to 2.15)	19.69	0.1097	465
9.4	2.13	4.00	(2.14 to 2.13)	19.32	0.1107	470
9.5	2.11	4.00	(2.12 to 2.11)	18.95	0.1118	475
9.6	2.09	4.00	(2.10 to 2.09)	18.58	0.1130	480
9.7	2.07	4.00	(2.08 to 2.07)	18.21	0.1142	485
9.8	2.05	4.00	(2.06 to 2.05)	17.84	0.1154	490
9.9	2.03	4.00	(2.04 to 2.03)	17.47	0.1167	495
10.0	2.01	4.00	(2.02 to 2.01)	17.1	0.1181	500
10.1	1.99	4.00	(2.00 to 1.99)	16.84	0.1187	505
10.2	1.97	4.00	(1.98 to 1.97)	16.58	0.1194	510
10.3	1.95	4.00	(1.96 to 1.95)	16.32	0.1200	515
10.4	1.93	4.00	(1.94 to 1.93)	16.06	0.1207	520
10.5	1.91	4.00	(1.92 to 1.91)	15.8	0.1215	525
10.6	1.89	4.00	(1.90 to 1.89)	15.54	0.1222	530
10.7	1.87	4.00	(1.88 to 1.87)	15.28	0.1230	535

10.8	1.85	4.00	(1.86 to 1.85)	15.02	0.1238	540
10.9	1.83	4.00	(1.84 to 1.83)	14.76	0.1246	545
11.0	1.81	4.00	(1.82 to below 1.82)	14.5	0.1255	550

VI. CONCLUSION

The A/D converter with LCD was fitted with the Analog fuel gauge of the two-wheeler and the result was successfully obtained. The A/D converter shows the amount of fuel in fuel tank in exact litres (EX : 1.3, 1.4, 1.5). The A/D converter shows the exact fuel in litres only when the the fuel in the fuel tank is more then 1 litre. The accuracy level is upto 95 – 98% because the error was around ± 0.2 litres, because the fuel in the fuel tank was measured on the basis of float level in the tank and we didn't use any other sensors. It displays the exact litres on plane roads and shows error value on slope surfaces.

VII. Future Enhancements

In future the proposed technique can be improved by adding fuel cells at different places of fuel tank to measure exact fuel levels at different conditions like day/night for particular densities at different altitude conditions of vehicle and a buzzer to announce the user about the abnormal conditions like low level, half level and full levels of the fuel tank to refill or warn themselves. The accurate distance to zero can also be done by programming the microcontroller by taking the input of present mileage with respective speeds and tank levels.

REFERENCES

- [1] Jaimon Chacko Varghese, Binesh Ellupurayil Balachandran "Low Cost Intelligent Real Time Fuel Mileage Indicator for Motorbikes" (IJITEE), Volume-2, Issue-5, April 2013
- [2] Deep Gupta, Brajesh Kr. Singh and Kuldeep Panwar "A Prototyping Model for Fuel Level Detector and Optimizer" page no 226-229 - African Journal of Basic & Applied Sciences 4 (6): 226-229, 2012 ISSN 2079-2034
- [3] Daniel R. McGlynn, "Vehicle Usage Monitoring And Recording System", US Patent 4072850, February 1978.
- [4] S. Kawamura, "Development of Navigation Control," Toyota Technology, Vol. 34, December 1984.
- [5] Ti-Ho Wanga, Ming-Chih Lua and Chen-Chien Hsu, 2009. "Liquid-level measurement using a single digital camera", Elsevier, Measurement, 42(4): 604-610
- [6] Farrell G. Butler, " Gasoline Mileage Indicator System," US Patent 3958453, May 1976
- [7] Betta, G., A. Pietrosanto and A. Scaglione," 1996. A digital liquid level transducer based on opticalfiber", IEEE Trans. Instrum. Meas., 45: 551-555.
- [8] Nitin Jade, Pranjali Shrivastava, Asvin Patel, Sagar Gupta "Modified Type Intelligent Digital Fuel Indicator System" *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X PP 20-23 in International Conference on Advances in Engineering & Technology – 2014 (ICAET-2014)*
- [9] <http://www.speedyjim.net>
- [10] <http://www.wisageek.com/what-is-a-fuel-gauge.htm>
- [11] <http://www.classictiger.com/mustang/OilPressureGauge.htm>