



Battery optimization for mouse technology

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Abstract

It is widely known that the wireless mouse operates with specific receiver due to its own frequency and a battery. As the battery consumed away, if there is no additional battery in the spare, the mouse remains unutilized and also it causes time delay and loss of productivity. Our aim in this project is to eliminate time loss and unproductive problems in the case of a run out by the aid of an additional apparatus we utilized. With this additional apparatus, time loss, unproductive situations and additional costs will be removed.

Keywords: Battery problem; wireless mouse; additional apparatus; battery hardware optimization

1. Introduction and Literature View

Mouse is a technological device which makes our computer usage easier and comfortable. Thanks to usage of mouse, for computers and other technological devices, we may make our duties in a short time and productively; however, an occurrence of any hardware failure may stop full systems [1]. Many studies have been conducted for avoiding those failures and hardware optimization [2,6].

Generally, mouse is classified as three types: wire mouse, wireless mouse and touchpad mouse which we use for notebooks. During the optimization process of mouse and its systems, the hardware industry was face to major problems due to increasing complexity of new technologies and the market requirements [7]. The wire mouse is firstly invented in 1941 and used for a long time. It is working with a ball which is under of it and once you move this ball it starts to work. Additional to wire mouse type, there is also a mouse type which is named as laser mouse. There is no ball under of it and it works with a laser lights. It sends movement signals to the receiver and operator can follow these movements on a computer screen. Advantage of this mouse type is that you have a chance to make your duties swiftly and there is no battery to use this type. This type has also some disadvantages. Firstly, let's

think that your computer is far away from your work desk and the wire of mouse is insufficient. Thus, there is no chance to use this type. Besides this disadvantage there is also visual pollution.

Other type is touchpad mouse. This type is easy to carry because of integrated to the notebooks and working with your fingers movement. The disadvantage of this kind is it has a limited usage area and for this reason you have no chance to make your duties fast with respect to wire and wireless mouse.

Another type which we use for our project is wireless mouse. With this part, laser mouse is most common for using. This type differs from other types with working system. There must be a battery to use this type and it has a receiver with its own frequency. This receiver is getting signals from mouse and transmitting them to the computer. If the battery is finished and there is no additional battery, the mouse will be unused. Our aim is to solve this problem permanently.

To be able to solve this problem lots of studies has been done. For instance, there are rechargeable batteries inside of the mouse and there is additional

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charger. During the idle time of mouse, you put the mouse inside of this charger and it is starting to charge the rechargeable batteries and you have to wait until the charge process is finished. This type has a big disadvantage and you have to carry this additional charger with your mouse.

Another type is working with the same system but there is little difference. It has no charger but it has a cable for charge the batteries. There are batteries inside the mouse again. During your usage or idle time you connect the cable to your mouse and to the computer and this cable charge your batteries. The disadvantage of this system is also you have to carry

additional apparatus which is cable, with mouse.

With our study, contrary to these studies, we developed additional apparatus and integrated it under the receiver to be able to remove additional carrying and loss of battery problems. In section 1 literature review will be shared and In section 2, we have mentioned much more regarding the problem and give some details about the usage methodology in section 3. In section 4, we have shared improvement of system, technical information about charger unit and system working process. We have mentioned test process in section 5 and finally, results have been shared in section 6.

2. Problem definition

With the loss of battery inside the mouse, if there spare battery, there will be time delay and different failures. Let's think that a real life application. There is an architect and he/she has to finish his drawing project till morning and it has too much importance. During working after midnight the batteries are finished and there is no spare batteries. This architect will be in a difficult situation against to manager. As far as happened in this real life application, this

process has gone to this person's loss of job. For the manager view, the company will lose its reputation and it will be difficult to get additional projects from this customer anymore.

With given easy real life example and many of them, it should be easy to understand the importance of this project. With the improvement additional charger unit, this process will be solved and lose of batter problems will not be anymore.

3. Solving methodology

In this section to be able to remove battery problems, as we mentioned real life application in previous part, solving methodology will explain comprehensively. In our system we have used four apparatus.

First apparatus is mouse and the second is its receiver unit. These two apparatus are using together. Third and Fourth apparatus are the batteries which we use for using instead of cell battery. The difference that we add under the receiver is charger unit. We have developed this system and integrated it under the receiver. It has a capable of charging the empty battery with 5 volt which comes from computer. After this unit charge empty battery, you integrate it

into the mouse and start to use it. As far as we mentioned before, there is additional battery which is empty. After you get the full battery from charger unit and integrated it in to the mouse, you put empty battery to the charger unit and it is started to charge. As we added to this system thermistor item, it is cutting the voltage which comes from the computer, the life of the battery is kept with this way.

After the full battery inside the mouse has been finished, the movement that you have to make is just change the batteries with each other. Empty battery will be in mouse and full battery will be under receiver. Just change them manually and keep on using mouse.

4. Current status of biomass energy in Turkey

In this section there will be additional information regarding our improved device.

4.1. Definition of apparatus

4.1 Definition of apparatus

4.1.1. Receiver unit

This unit is generally selling with mouse and it is use for transmitting signals to the computer. It works with the 5 volt which comes from computer.

4.1.2. Charger unit

This unit is integrated under receiver. It has a charge capability and charging empty batteries with the 5 volt current coming from computer USB socket.

4.1.3 Battery

Battery is use for mouse and it is possible to charge it

in three hours with this improved device. It has almost three of four weeks usage time with depends of your usage frequency.

4.2. Definition of system

This system is consist of a receiver, two batteries and a charger unit. In receiver unit, we have integrated charger unit as well. This unit is working as fast charger and charge two kind of AAA cell batteries in three hours. Thanks to thermistor which is inside of

this unit, it blocks the current automatically and this will result with long life for battery.

The charger unit is located under receiver and using for charging empty batteries.

During the idle time of mouse, it is possible to carry receiver and mouse as one piece with putting into the mouse from its behind socket.

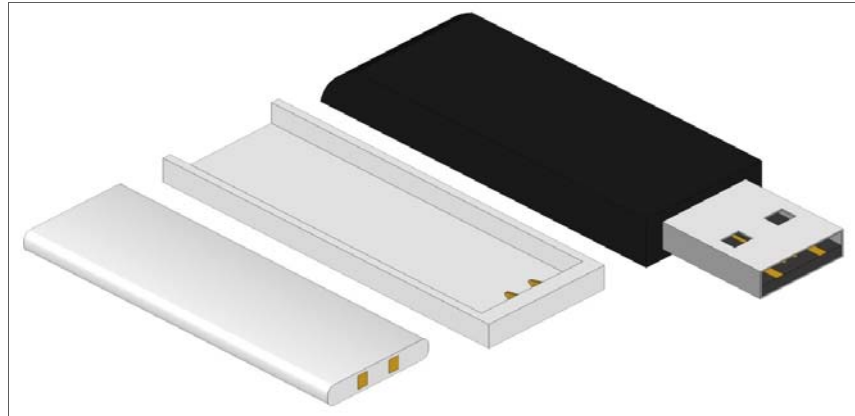


Figure 1. Apparatus of receiver

4.3. Working of system

In standard configuration of our system, there must be two batteries. Firstly, put one of the empty battery in the charger unit and wait till the charge process is finish. After this process finished, put this full battery in to the mouse from it behind socket and it will be active. Then it is possible to use it in this process.

With the additional battery which is empty should be putted into charger unit after you get full battery. The full battery is consuming in the mouse and the empty one is charging. After empty battery is full, it will be

waiting in charge unit. After the full battery is finished which is in mouse, you should change the batteries as manually. With this movement, battery charge problem will be solved.

After all this process happened and your computer is off, there is an easy way to carry your mouse as one apparatus. For this, the mouse is design to be able to carry receiver system inside of it and after you put it from the behind socket, it will be easy to carry it as one piece (Fig 2).



Figure 2. Mouse and receiver as one peace

5. Test process of system

To be able to test workableness of system, firstly the electronic items are located onto the breadboard (Fig

3). According to test results, 2500 mAH batteries are charged almost in three hours [1].

Secondly, we have tested new system which takes its energy from the receiver. After get affirmative results, we used parallel line between receiver and charge system. We observed that, with 5 volt current which comes from computer is charged the battery

and system get active.

At the end of tangible result of these tests, it has been proved that this item is possible to produce. With this way, the project is appropriate for industry with a good design.

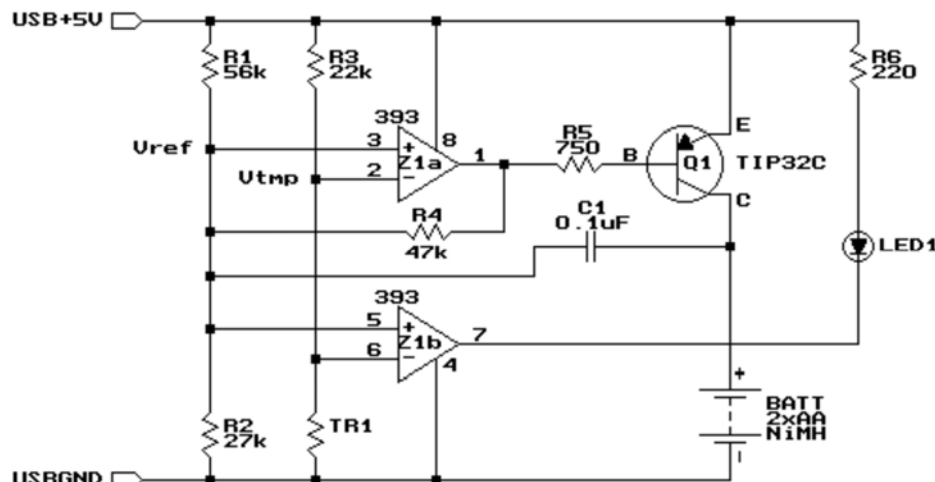


Figure 3. Electronic system of charger

6. Conclusion

The most common problem for mouse users is the ending of the cell battery in unexpected time. At the end of this happening, time lose and additional costs show up as we mentioned as a real life example in Introduction section. These kind of real life examples are increasable. To be able to deal with these problems, we have suggested a different way. With the test results and observed ones, new and better

system is designed and battery problem is solved permanently.

For future research, nanotechnology is better way and batteries which are as nano size is usable. To be able to this process, receiver and batteries should be in the same size. Additional to this direction, better ergonomic designs are possible to make better view.

References

- [1] Kumar, A., Saini, M., & Malik, S. C. (2015). Performance Analysis of a Computer System with Imperfect Fault Detection of Hardware. *Procedia Computer Science*, 45, 602–610.
- [2] Amari, S.V., Dugan, J.B. and Misra, R.B.(1999): "Optimal reliability of systems subject to imperfect fault-coverage, *IEEE Trans. On Reliability*, vol. 48, pp. 275-284.
- [3] Arnold, T. F. (1973): The concept of coverage and its effect on the reliability model of a repairable system, *IEEE Trans. On Computers*, vol. C-22, pp. 325-339
- [4] Sahner, R., Trivedi, K. S. and Puliafito, A.(1995): Performance and Reliability Analysis of Computer Systems: An Example-Based Approach Using the SHARPE Software Package. Kluwer Academic Publishers, Boston, MA.
- [5] Welke, S.R.; Johnson, B.W. and Aylar, J.H. (1995): Reliability modeling of hardware / software systems, *IEEE Transactions on Reliability*, Vol. 44, No. 3, pp. 413-418.
- [6] Bouricius, W. G., Carter, W. C. and Schneider, P. R. (1969): "Reliability modeling techniques for self-repairing computer systems," *Proc.24th Ann. ACM., Nat'l Conf.*, pp 295-309.
- [7] Lopez Flores, R., Belaud, J. P., Negny, S., & Le Lann, J. M. (2015). Open computer aided innovation to promote innovation in process engineering. *Chemical Engineering Research and Design*.