Controller designing for use in laser targets in Paralympics shooting

Dorna Abedini, Hamed Alipour Benaee, Behzad Yasreb
Department of Electrical Engineering, Tabriz Branch, Islamic Azad University,Tabriz, iran
Email:dorna.abedini@yahoo.com

Abstract

Since 1976, Shooting was include in Paralympics sport mach's to establish same target conditions for different types of handicapped people, it is essential design a system of "laser target controls". In this study, a laser target controller is designed by determinable of wave length of laser accuracy then, by using parameters, performance and ever redacting, theses wave length import as inputs to system. Finally constantly enchase shooting abilities of shooter.

Keywords: handicapped shooting, controller system, laser targeting.

1- Introduction

The disabled athletes compete against each other in different groups based on the similarity of the type of disability and movement constrains.

Regarding the fact that during some recent years a specific consideration of sports by the disabled athletes has been noticed all over the world, the researchers have started a great deal of studies to develop different fields of sports related to disabled athletes. Designing and application of technologies and certain tools in achieving this goal have been the focal point for many. Laser gun has been one of the tools utilized in shooting competitions among the disabled athletes. Regarding the different types of disability and different levels of it, increasing the precision in shooting through these types of guns has been deemed highly important [4, 5].

Now it seems that through unifying the pointing conditions in different stages of shooting among the disabled athletes on the one hand, and enhancing the spirits and self esteem of the athletes on the other hand, we can define a certain type of laser targets' controller system.

Considering the studies carried out in the field regarding laser issues, the most common works carried out in the field were mostly due to logical circuits, up amp, and image processing. In the present research we have tried to focus on designing high working frequency controllers with high resolutions to enhance the precision of laser wheel controller.

The parameters utilized in this research were RF comprised of 2 kilo ohms to 15 kilo ohms. Due to the calculations carried out regarding the stages of the systems, we have used the third level system although they have been regarded as inconsistent [11, 12, 13]. Now, based on this outcome, we will focus on designing a controlling system based on laser development technology development which has been promoted tremendously during the last decade in a way that today laser is considered as an inseparable part of the life among human beings [1, 2, 3].

Shooting is one of the fields practiced by disabled athletes and it was entered into Paralympics matches since 1976. According to the rules dominating Paralympics, disabled athletes with lack of ability to move their underbody parts or those who are forced to use wheelchairs can take part in this sports event.

There are three categories defined for such groups of athletes: SH1, SH2, and SH3. The level SH1 contain athletes whose upper-body parts are healthy and who can hold the gun and shoot easily. SH2 includes all athletes who are disabled in their underbody parts or who have lost both under and upper parts completely. Regarding the first case, the athletes are able to hold the gun on their upper part bodies, but in case of the second group, they mostly utilize helmets with guns installed on. SH3 is related to disabled blind athletes. It should be noted that currently, only two stages of SH1 and SH2 athletes can compete in Paralympics and still we don't see level SH3 entering the competitions formally [6, 7, 8].

Considering the fact that athletes among SH2 group, specifically when they have lost both their upper body parts, could difficultly recognize and shoot at targets and they loose a lot of energy and their ability each time they recognize and shoot at goals. Therefore, the size of circles to shoot at is considered bigger than the one recognized for SH1 level [9, 10].

2- Experimental part

There is not still a control system achieved whose parameters are calculated to optimize the frequency responses by a sensible circuitry model. In the present research the major goal is to design a controller system based on a sensible circuitry model. In such a control system, the parameters of a completely electronic circuit and the controlling characteristics of a system have been discussed fully and finally a consistent response has been preplanned to reach through the process. One the electronic circuit has been without a feedback (figure 1) and once it has been with a feedback (figure 2).

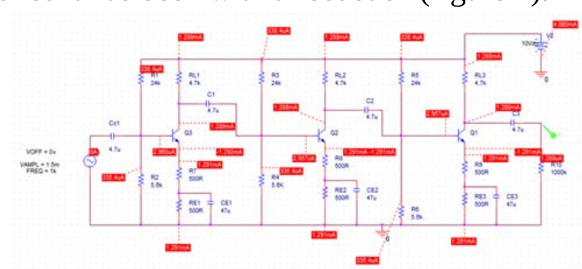

Fig.1. The introduction of a control system based on an electronic circuit without a feedback

Each common emitter level in a control system based on a without feedback electronic circuit is equal to a system with two poles.

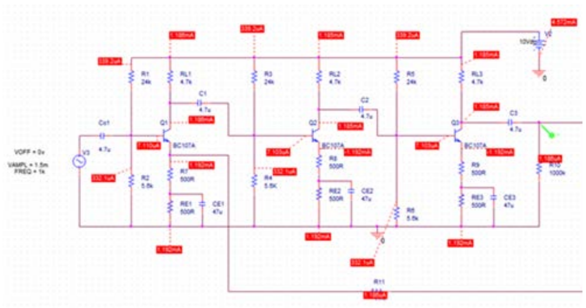

Fig.2. The introduction of a control system based on an electronic circuit with a feedback

We considered a feedback of series voltage type to realize network feedback productivity remarked in control system diagram blocks and we investigated its effects on frequency performance and consistency and the output of such a controller circuit was represented as a laer system wheel [fig. 2].

3- Results and discussion

In this part we can represent the results gained from the input of control system circuits wih and without feedback. Figures 3 and 4, represent the results of three poled plates with and without feedback that show the working bandwidth in a control system without a feedback has been lower than the one in a control system with a feedback. It was observed that increasing a feedback to a third order system can enhance frequency responses (regarding bandwidth). But in this case, the system consistency may be endangered. Therefore, we search for a medium state meaning a longer bandwidth and a higher consistency. This can be achieved through regulation of the amount of empedence of the feedback nework. Figure 4 shows that for 2 kilo ohms to 15 kilo ohms, we can gurantee consistency too.

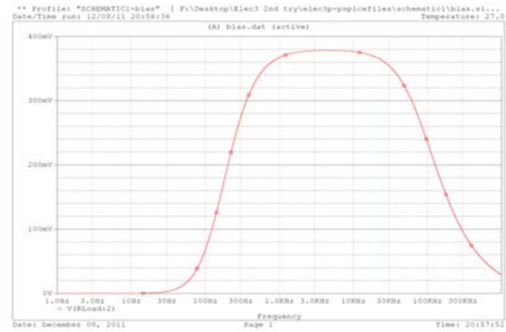

Fig.3. The domain graph based on output frequency of the control system without a feedback

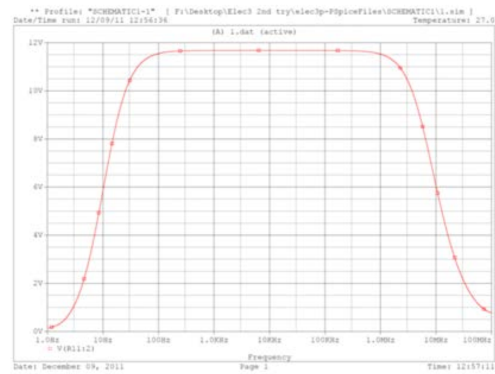

Fig.4. The domain graph based on output frequency of the control system with a feedback

Figure 5 represents the frequency behavior of the intended system based on domain diagrams and bode phase. As it seems apparent, by enforcing feedback through Rf resistor from output onto the input using series-voltage feedback type, it can be observed that bandwidth increases due to the longer distance of the dominating pole and this results in increasing bandwidth and finally it leads to system working frequency boundary. Also, the diagram phase showed that the system consistency has been guranteed within the boundary of the frequency and there would be a consistent state of fequency behavior.

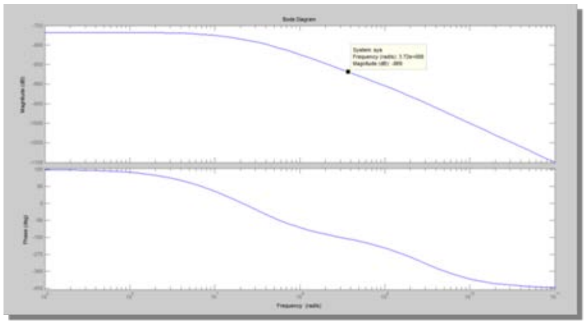

Fig.5. Bode diagram representation

Also, figure 6 represents the geometrical location of the roots. It can be observed that in the intended system, the amount of the feedback parameter has been arranged in a way that the system can never reach fluctuating status and it would stay in a consistent mode. Therefore, the circuit model has been selected for roder 3 system and it would be easily estimated regarding the behavior.

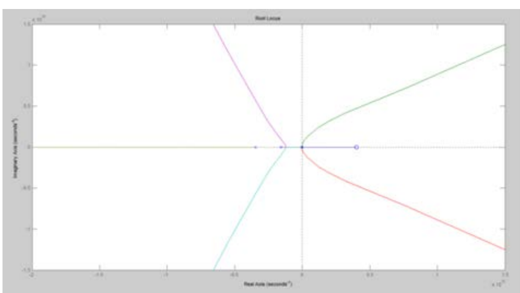

Fig.6. Diagramatic representation of the geometrical location of the root

In the present study and regarding the control system relationship related to the laser and oits working frequency, we have utilized a completely cicuitry model of electronic type for the first time. This model has been represented completely sensible system controller controlability charachteristics through circuit parameters. By applying feedback in the system regarding its circuit we have introduced consistent and fequent behavior and different topical issues were utilized to make conclusions. Also the performance boundary of circuit frequency has been calculated regarding the aaplication of feedback. Through the arrangements of resistance amount of the feedback within the boundary represented we can reach the related conclusions.

In addition to frequency boundary regulations, we have applied enough sensitivity to system consistency and it was approved to be such. It was concluded that the control system could not reach inconsistency due to the importance of laer targets' shooting processes because if it was not the case, the intended goal would not be reached through pointing by a laser system.

Also bode diagrams were used to prsent the circuitry model regarding the domain and phase and it was approved that through feedback parameter arrangements we can recognize all characteristics related to the controllable system determined.

4- Conclusion

Regarding the results, it seems that the designed system in the present study has had other useful characteristics besides the intended controlling features to be utilized delicately by the disabled athletes to recognize the goal when shooting. In this way, using an electronic circuit can simplify the functions of the tool in different frequencies due to the completely precise arrangements of the circuitry parameters within the tool. If we use the mechanical parameters in such systems, the precision will reduce greatly.

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