

Overall Design Criteria

1. Maximum Attainable Serving Frequency
2. Adjustment Accuracy of Serving Frequency
3. Automatic Feeding at Certain Frequency
4. Collecting Properly Returned Balls into the reservoir
5. Serving Accuracy and Precision
6. Maximum Attainable Serving Speed
7. Selectable Serving Modes
8. Adjustment Accuracy of Pitch and Yaw Angle
9. Ease of control
10. Portability
11. Capacity
12. Ball Durability
13. Power Consumption
14. Spin Options
15. Cost
16. Ease of manufacture

Functions' Criteria

1. Accuracy and Precision
2. Response Time
3. Adjustability
4. Component compatibility
5. Ease of manufacture
6. Cost
7. Ease of control
8. Energy Consumption
9. Max rotation speed
10. Transfer speed
11. Capture Rate
12. Portability
13. Capacity
 - a. Smooth Flow without Jamming
 - b. Maximum Transfer Speed

Subfunction Extra Design Criteria

17. Adjustment rate: Adjusting a parameter is important. However, this process occurs in time. Hence, the faster the better.
18. Adjustability: Derived from the adjustable serving speed/spin/frequency criterias.
19. Component compatibility: some solutions are more flexible and can be used with different combinations of the concepts.

- 20. Max rotation speed: important parameter for motors
- 21. Energy consumption: derived from power consumption

- 22. User friendliness: most user interfaces are mainly designed considering this criteria. However, it is not important for any other part of the system.
- 23. Appearance: Appearance of the user interface. It affects the choice of the customer while buying a device.

- 24. Precision: comes from accuracy and precision
- 25. Capture rate: important selection criteria for catching concept selection, but not apply to any other part of the system.

- 26. Transfer speed: derived from frequency
- 27. Efficiency: Important for continuous operation (for the ball transfer to the launch)

- 28. Ease of loading: Important for storing.
- 29. Ball recyclability: Recycling the balls occurs at the storage only. For automatiza the more the better.

Cost: An engineering product that will be produced and sold must be profitable for the producer/ manufacturer and affordable for the customer.

Ease of manufacture: Sometimes a solution may look as the perfect candidate to meet the customer needs. However, it may not be very easy to manufacture for the producer at that instant. For example, a company's current manufacturing abilities or contracted manufacturers may not have the technology/ device which requires another contraction or machine installation. In such a situation, instead of disregarding this solution we can keep it in our possible solution list for later use.

User interface: Bonus criteria for the project. Creating a user interface and making it simple to use will improve customer satisfaction.

Ease of control: Controllability of an automatic device is crucial.

EVALUATION CRITERIA (29.11.2024)

1. **Maximum Attainable Serving Frequency:** The highest number of balls the machine can serve per second. Measures the machine's overall capability to serve balls at its highest possible rate, regardless of how the balls are fed.
2. **Serving Frequency Adjustment Accuracy (%):** The precision of frequency adjustment, measured as deviation from the target frequency.
3. **Maximum Feeding Speed:** The rate at which the machine loads and serves balls from the reservoir, ensuring continuous and efficient operation without interruptions. Focuses specifically on the efficiency of the feeding mechanism to supply balls into the serving system at a consistent rate.
4. **Maximum Attainable Pitch Angle (degrees):** The highest vertical angle the machine can achieve, determining its capability to simulate lobs or high-arc serves.
5. **Maximum Attainable Yaw Angle (degrees):** The widest horizontal angle the machine can reach, allowing it to target various positions across the table for diverse shot placement.
6. **Ball Prevention Efficiency (%):** The proportion of prevented balls from escaping successfully and transferred to the reservoir.
7. **Serving Accuracy (cm deviation):** Average deviation of the ball's landing point from the target.
8. **Serving Precision (cm spread):** Consistency of serving, measured as the standard deviation of ball landing points.
9. **Maximum Attainable Serving Speed (m/s):** The fastest ball velocity the machine can achieve.
10. **Serving Modes Variety (count):** The total number of distinct serving modes available.
11. **Portability(1-10):** Subjective score based on factors such as weight, size, and transportability.
12. **Reservoir Capacity (balls):** Maximum number of balls the reservoir can hold.
13. **Ball Durability:** Percentage of wear or deformation observed on balls after a specified number of serves.
14. **Energy Consumption:** Average power usage during operation.
15. **Spin Options Variety:** Number of spin types the machine can generate (e.g., topspin, backspin, sidespin).
16. **Cost:** Total cost of manufacturing or purchasing the machine.
17. **Ease of Manufacturing:** A subjective score reflecting the ease or difficulty of manufacturing the machine.
18. **Response Time (seconds):** The time the system takes to reach its target value after a command, indicating its speed and efficiency.
19. **User Friendliness:** It focuses on the clarity of the controls, the simplicity of the process, and how quickly a user can achieve desired outcomes without confusion or excessive effort.
20. **Ease of Control:** It evaluates how straightforward and intuitive it is to manage, adjust, or optimize the system during development and operation, ensuring minimal complexity and effort.

