Literature Review 3
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Primary Paper:
"Interactive Design of 3Dprintable Robotic Creatures" by V. Megaro, B. Thomaszewski, M. Nitti, O. Hilliges, M. Gross, and S. Coros.

Secondary Paper:
"Cogeneration of Mechanical, Electrical, and Software Designs for Printable Robots from Structural Specifications" by A. M. Mehta, J. DelPreto, B. Shaya, and D. Rus.

Paper Review:
Nowdays, virtual characters are very common in computer graphics, especially in the computer games fields. Researchers and engineers have begun to create the physical characters to mimic their corresponding virtual appearance. However, these physical creators are not able to walk steadily and can not make or print by novice users. There are two challenging parts. Considering robot spiders, designing motion coordination between different parts and implementing expressive animations in combination with a high degree of freedom are complex and complex.

In order to solve the problem above, the authors put forward an interactive design interface in the primary paper, which allows novice users to easily personalize robot creatures, and the interface automatically provides stable motion according to the user's advanced input [1]. Then, in order to personalize the robot, the design interface provides a user-selectable framework for editing the robot structure, primarily joints, using virtual motors by adding or removing them and adjusting their position and orientation. Here, users can edit footsteps, gestures and swings and change their duration and relative order to provide simple and personalized motion editing. Also, different footwork has been given out: walking forward, walking sideways, turning around and jogging. Real-time motion feedback in a physical simulation environment is generated and provided to users for faster iterative design. After the design process, the system generates 3D printing preparation parts, and users can purchase off-the-shelf actuators to revitalize the living creatures.

As for the strength of this paper, the design interface is easy to use and users can forget about the physical viability of printing robotics. For beginners, all the technical details of the quality center, pressure center and angular velocity are hidden and stored in software, making the design process much easier. Another advantage is that not only stable movements can be easily achieved but also movements can be easily performed. However, the author did not describe how the body parts except the joints are designed, and the software limits the diversity to only predefined organisms. The author seems to limit the movement of walking and can not design other movements in the design interface, such as the head and hands.

Among all the bibliography papers, I chose an article published earlier, which is trying to solve the same problem, but it focused more on the hardware level. The authors do propose a system that could jointly generate the mechanical, electrical and software components of a robot [2]. Then they encapsulate a modular design paradigm that separates components, which allows the new users to use reusable components of different designs rather than new designs by expert engineers for different robots. Modular electronics are implemented through a distributed electrical layout that reflects the distributed robotic system connected to the micro-controller unit, which enables new user reusability and complex system design. Code are automatically generated to design specific configuration and communicate in the distributed system. In order to use the robot, assembly instructions and a basic user interface are also generated. So users can control LEDs, servers and fixtures.

Compared with the paper [1], the secondary paper emphasizes the reusability of producing electrical components and hardware in different robot designs. However, the author does not discuss the physical feasibility and sports design which the main paper focuses on. On the other hand, the authors in the secondary paper discussed hardware other than actuators such as LEDs, generated by microprocessor programming code. It also generates hardware assembly instructions which are not covered in the main paper. The software presented in both papers is complementary and can form a complete robot design system.

References

[1] V. Megaro, B. Thomaszewski, M. Nitti, O. Hilliges, M. Gross, and S. Coros, "Interactive Design of 3Dprintable Robotic Creatures," ACM Transactions on Graphics (TOG) - Proceedings of ACM SIGGRAPH 2016, vol. 34, no. 6, pp. 216:1–216:9, 2016.

[2] A. M. Mehta, J. DelPreto, B. Shaya, and D. Rus, "Cogeneration of Mechanical, Electrical, and Software Designs for Printable Robots from Structural Specifications," in 2014 IEEE/RSJ International Conference on Intelligent Robots and Systems, 2014, pp. 2892–2897.