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# Development of an orientation control unit having a Multi-stage inflatable frame

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**Keywords:** Rescue robot, Multistage inflatable frame, FSB, 3 degrees of freedom, Keeping the end part in a horizontal position.

Recently, we frequently suffer from natural disasters like the Iranian earthquake, the Niigata-chuetsu earthquake. It makes to several hundred thousand victims instantaneously. Moreover, in 2001, the Newyork city in United States of America's people suffer from an artificial city type disaster caused by the September eleven terrorist attacks. And the probability of the Southerb sea earthquake and the southeast sea earthquake occur on the scale of magnitude 7 to 8 be said 40 to 50 percent, at the large Pacific Ocean coast area put from Tokyo in Japan to West Japan within 30 years in the future. So the establishment of disaster prevention and the life rescue system to such a city type disaster are very aspired.

In Japan, it begin to focus attention on the life rescue system to the city type disaster, since suffered the Hanshin-Awaji(Kobe) earthquake. Now, Centerring on the NPO international rescue system research mechanism go about the research on the life rescue system. In the one expected most in these researches, there is "Life rescue system using the robot". Because the robot researchers in the United States organizing the team with the rescue team, and doing the life search activity using by the mobile robot, and found two or more remains of the victims by 9.11 from under the rubble. This case was drafted the robot for the first time in an actual rescue site officially.

Afterwards, the research on the rescue robot starts rapidly, and became a part of Ministry of Education's urban renaissance project "Metropolitan great earthquake reduction making special project" is a movement in the air group in Japan in 2002. The robot and the related technology were utilized by this, and the development was made on the disaster correspondence technology. The disaster correspondence technology for three work mainly separate, the exploration and support type, the obstruction removal support type, The information collection type.

In the situation revolving around us, the robot who specialized for each work is studied and developed. However, there is mainly a problem still, and they must be solved. Then, this research take particular note of the exploration and support type. The block such as the rubble in the disaster environment is very unstable and dangerous. Therefore, the necessary robot is lightweight. Goods such as the rescue equipment are often insufficient, when the disaster arose. Therefore, those rescue equipment must be large carried from another region. So, the high expansion and contraction rate, the lightweight is problem. However, those problem reaches solution that reduction and decomposition of the robot. And, the plan that it is made to spread through the family conflict by the robot and adds the rescue function. Even in that case, the necessary robot is lightweight, the high expansion and contraction rare. Given this situation, I think that the problem is important issue.

Moreover, the disaster environment is nonuniform environment. Therefore, The robot seems to have to have been transformed to the shape adapted in the every situation. And, it is necessary that the simple repair is possible, when it broke down in the field. And, I think that by equipping with what kind of sensor unit, it must be able to use it.

This research was produced inflatable actuator (Film Surfaced Bellows : FSB) which had never been able to deflate to before develop shape. Then, they are combined multistage, the lightweight, the high expansion and contraction rate. And, the flexible adaptation in proportion to the object situation is enabled, and the level maintenance of the end part is realized.

In this paper, realization of high expansion and contraction rate and theoretical formula for obtaining the optional angle is proposed. Then, this is proposed multistage inflatable frame having 3 degrees of freedom.

And, the operating speed of each FSB, a migratory mechanism platform puts it on, it is operated and is evaluated. The confirmation of the value of the theoretical formula using it. By putting the load on the end part, the angle is evaluated.

Therefore, if migratory mechanism platform slanted, Each FSB in proportion to the angle could be developed. This paper was shown effectiveness and the realizability of keeping the end part in a horizontal position.