

## SMART CLOTHING IS THE FUTURE

Dilshodbek Yusupov

dilshodbekyusupov1992@gmail.com

Kimyo International University in Tashkent

**Abstract:** This article highlights the technological capabilities of smart clothing, its role in health monitoring, sports activities, child safety, and everyday convenience. Smart clothing developed on the basis of sensors, GPS systems, temperature control, and energy-harvesting technologies is analyzed as an important innovative tool for improving human quality of life and ensuring safety.

**Keywords:** smart clothing, smart materials, sensor technologies, electronic garments, health monitoring, GPS system, child safety, temperature control, energy harvesting, innovative fashion, photovoltaic technology, sportswear, smart textiles, digital technologies, safety monitoring

Smart clothing is an innovative development consisting of intelligent garments with technological capabilities. These garments can connect with the human body and collect, transmit, and process various types of data (see Figure 1). They operate with the help of sensors, electronic components, and smart materials. Smart clothing is commonly used for health monitoring, tracking sports activity, studying environmental conditions, and even creating new approaches in the field of fashion.



Figure 1. Smart clothing

Capabilities of smart clothing: Smart clothing, such as T-shirts or sportswear, can monitor heart rate. This helps to control and assess heart activity. Some smart garments can measure breathing, blood pressure, and oxygen levels, which may be used in medical monitoring (see Figure 1.1). These garments continuously monitor body temperature and provide alerts when changes occur, particularly in cold or hot conditions.

Some devices, when integrated into clothing, can monitor muscle activity, movement, and physical skills. For example, this can be highly useful for athletes. Smart clothing helps athletes

track physical exercises, distance, and speed. Some smart garments designed for runners monitor heart rate, calorie loss, and other parameters. Through smart clothing, the activity of muscles and joints can be analyzed, making it possible to optimize exercises.

Smart clothing, such as sports trousers or T-shirts, may include motion sensors to monitor physical condition and movements. Modern smart garments can automatically regulate temperature. For example, in cold weather, the heating system can be activated through microchips integrated into the clothing. Smart clothing can also measure environmental humidity, temperature, and wind speed. This is especially useful for people working in hazardous areas or travelling. Some garments are capable of changing color depending on temperature or light.

Currently, several major companies are among the leading manufacturers of smart clothing. For example, AiQ Smart Clothing is one of the leaders in this field, while Adidas is also known for applying smart fabrics in sportswear. In addition, brands such as Ralph Lauren, Levi's, and Vollebak also produce smart clothing. Ralph Lauren's "PoloTech" shirt is designed for athletes and helps monitor physical indicators during training through built-in sensors. Vollebak, on the other hand, produces smart jackets for extreme conditions, including garments made from materials that adapt to weather conditions.

Some smart garments use photovoltaic technologies to collect energy from sunlight. Such clothing can be used as an energy source for other devices, for example, to charge a phone. At the CIS exhibition held in the United States, ANKER presented a modern outer garment powered by solar energy. This cloak not only has a modern appearance but also reflects the practical benefits of advanced technologies in everyday life.

The main advantage of this innovative development is that it integrates perovskite solar panels capable of generating 30 watts of power. This makes it possible to charge small gadgets and mobile devices under various conditions. LED lighting elements give the garment a modern "cyberpunk" style appearance (see Figure 1), making it aesthetically attractive.

This garment is very convenient for specialists working in extreme conditions. Although ANKER has so far presented this product only as a concept at the exhibition, it may become a significant step toward the wider use of sustainable energy technologies in the future. At the CIS 2025 exhibition, this product attracted considerable public interest. Experts emphasize the importance of developing environmentally friendly innovations through the efficient use of sustainable energy.

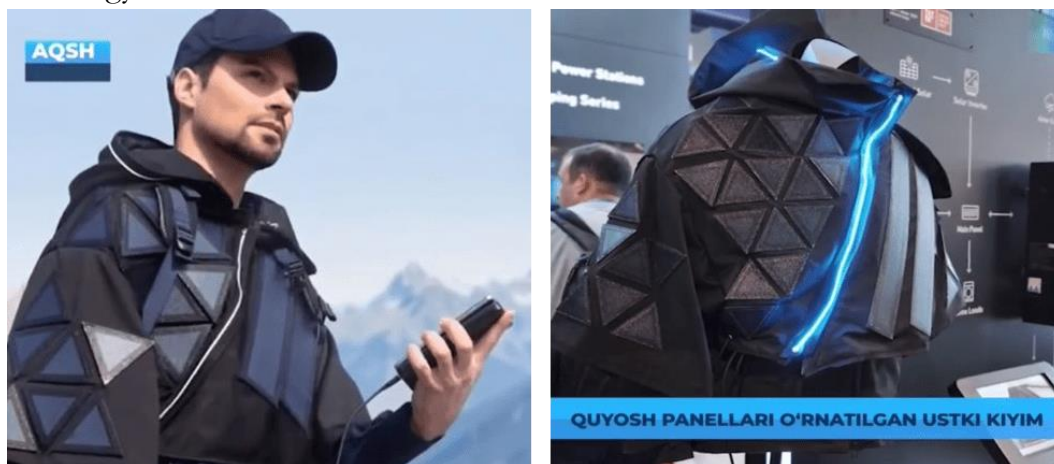


Figure 1 Smart clothing demonstrated by ANKER company

Smart clothing is expected to have more advanced capabilities in the future. Its functions, safety features, and energy-harvesting opportunities may be further developed. It is also expected that smart clothing will become more widespread in everyday life and will make it possible to continuously monitor people's movements and health conditions.

A new project developed by Indian engineer-designers has been introduced to the market. The heat-retention technology of the new thermal suit has been improved. The new smart clothing presented by TOYOMO is attracting attention with its simple appearance and ease of control (see Figure 1). The carbon fiber heating system warms up, while the thermal insulation effect of aerogel is three times higher than that of ordinary clothing.



Figure 1 Smart clothing presented by Toyomo company

It has an intelligent temperature control system. It is equipped with a built-in USB interface, does not require a special battery, and is compatible with all 5V mobile power sources.

Smart clothing is a highly effective tool for ensuring children's safety. It makes it possible to track children's location, monitor their health, detect emergency situations, and implement other safety measures. These technologies help create a safer, more convenient, and more controlled environment for children.

Smart clothing allows children's location to be tracked in real time. The garments use GPS technology and automatically send the child's location to the parents' phones or other devices. If a child leaves a designated area, parents or responsible persons receive an alert message. This process is called geographical boundary control or geo-fencing.

For example, when a child leaves school or moves far away from home, the system immediately sends a warning. For this purpose, the routes must be determined in advance. After that, if the child is moving toward a dangerous or undesirable place, the smart clothing automatically sends an alert. For instance, if the child approaches a main road, a signal may be sent from the garment.

If a child falls or gets into an emergency situation, the sensors installed in the clothing automatically send a signal to the parents or emergency assistance system. In such situations, time is very important, and the emergency response system can immediately identify the child's condition.

Smart clothing can monitor children's body temperature, heart rate, and breathing. This is especially useful for children with chronic diseases or respiratory problems. When a child becomes cold or has a fever, smart clothing automatically measures body temperature and sends an alert if necessary.

Some smart garments are equipped with special sensors for dangerous situations. By setting safe zones, for example, a child may be required to stay within a designated park for play. If the child leaves that area, the smart clothing automatically sends a warning.

In conclusion, it can be stated that smart technologies can improve people's daily activities, and this process has already begun. In our country, there are also enough organizations and scientists working with smart technologies. It is hoped that smart technologies will make it possible to build a safer life for children.

### References

1. Мавлонов, А. А. (2024). ТИЛ МАСАЛАСИ–МАЪНАВИЙ МУСТАҚИЛЛИКНИНГ АСОСИЙ ШАРТИ СИФАТИДА. Вестник магистратуры, (6-1 (153)), 42-46.
2. Мавлонов, А. А., & Раҳимжонова, И. (2023). ЎРТА ОСИЁГА ФОТОГРАФИЯНИНГ КИРИБ КЕЛИШИ ТАРИХИ. Вестник магистратуры, (5-3 (140)), 44-45.
3. Мавлонов, А. А., & Абдулҳафизов, М. (2023). ФИҚҲ ЁКИ ИСЛОМ ҚОНУНШУНОСЛИГИНИНГ ВУЖУДГА КЕЛИШИ ТАРИХИ. Вестник магистратуры, 46.
4. Kudratkhodja, S., Alptekin, M. Y., Altinboyev, N., Pulatova, D., Mavlonov, A., & Aripov, M. (2026). DISAPPEARING WEDDING RITES OF PASSAGE IN UZBEKISTAN: MODERNIZATION AND FUNCTIONALIST PERSPECTIVES.
5. Anvarxanovich, M. A., & Safoxon, M. (2023). QADIMGI DUNYO TARIXIDA O'RTA OSIYO XALQLARINING MILLIY ISTIQLOL OZODLIK HARAKATLARI. Вестник магистратуры, (5-3 (140)), 42-43.
6. Mavlanov, A., & Mirzohidov, S. (2024). THE CULT OF WATER IN THE ANCIENT BELIEFS OF THE UZBEKS OF THE FERGANA VALLEY. Science and innovation, 3(C1), 5-7.
7. Mavlonov, A., & Mirzohidov, S. (2024). USE OF INNOVATIVE TECHNOLOGIES IN HISTORY TEACHING METHODOLOGY. Science and innovation, 3(B8), 26-28.
8. Mavlonov, A., & Mirzohidov, S. Uzbek Cultural Heritage: Preserving Traditional Songs Importance AND Methods. Galaxy International Interdisciplinary Research Journal, 12(8), 20-26.
9. Mavlonov, A. (2021, June). WATER CULT IN ANCIENT RELIGIOUS BELIEFS (Based on materials from the Fergana Valley). In Конференции.
10. Niyozov, J. (2026, January). DEVELOPING HISTORICAL THINKING OF PRE-SERVICE HISTORY TEACHERS THROUGH MUSEUM PEDAGOGY. In International Conference on Science, Education & Law (Vol. 2, No. 1, pp. 4-7).
11. Niyozov, J. (2026, February). DEVELOPING THE AXIOLOGICAL COMPONENT OF HISTORICAL THINKING IN PRE-SERVICE HISTORY TEACHERS BASED ON MUSEUM PEDAGOGY. In International Conference on Culture & History (Vol. 2, No. 2, pp. 8-12).
12. Niyozov, J. (2026, February). MUSEUM PEDAGOGY AS A TOOL FOR DEVELOPING SOURCE-CRITICAL AND INTERPRETATIVE SKILLS IN PRE-

SERVICE HISTORY TEACHERS. In International Conference on Social Sciences & Humanities (Vol. 2, No. 2, pp. 11-15).

13. Niyozov, J. (2026, January). DEVELOPING HISTORICAL THINKING THROUGH THE INTEGRATION OF MUSEUM PEDAGOGY AND INFORMATION TECHNOLOGIES. In International Conference on Arts, Society & Humanities (Vol. 2, No. 1, pp. 24-27).

14. Niyozov, J. Educational Potential OF Museum Pedagogy AND Criteria for Its Application in Developing Historical Thinking OF Pre-Service History Teachers. Maktabgacha va Maktab Ta'limi Jurnal, 676773.

15. Niyozov, J. Bo 'lajak Tarix O 'qituvchilarini Muzey Pedagogikasi Vositasi Orqali Tarixiy Tafakkurini Rivojlantirishning Modeli. Maktabgacha va Maktab Ta'limi Jurnal, 675308.

16. Арифханова, З. Х., Абашин, С. Н., & Алимova, Д. А. (2011). Узбеки.

17. Саримсоцов, А. А. (2011). Узбекларнинг таквимиий маросимлари (Фаргона водийси материаллари асосида). Тошкент: Yangi Nashr.

18. Саримсоков, А. А. (2010). Календарные обряды узбеков (на основе материалов Ферганской долины).

19. Abdiraximovich, S. A., & Tursunpulotovich, M. M. (2025, September). O'ZBEKISTON VA KOREYA RESPUBLIKASI MUNOSABATLARI YANGI BOSQICHDA (NAMANGAN VILOYATI MISOLIDA). In Partner conferences of the International Scientific Journal Research Focus (Vol. 1, No. 2, pp. 369

20. Abdiraximovich, S. A. (2025, August). NAMANGAN VILOYATI QORAQALPOQLARIDA HUNARMANDCHILIK AN'ANALARI. In Partner conferences of the International Scientific Journal Research Focus (Vol. 1, No. 1, pp. 135-139).

21. Abdiraximovich, S. A. (2025, August). O 'ZBEKLARNING TAQVIMIY MAROSIMLARI: BAHORIY SAYILLAR. In Partner conferences of the International Scientific Journal Research Focus (Vol. 1, No. 1, pp. 152-156).

22. Саримсоков, А. А. (2024). The ritual of "qo'sh chiqarish" among Uzbeks and its territorial features (on the example of the Fergana Valley). Историческая этнология, 9(2), 214-223.

23. Sarimsokov A. A. Navruz: Customs and Ceremonies //Central Asian Journal of Social Sciences and History. – 2024. – Т. 5. – №. 2. – С. 14-20.

24. Sarimsokov A. A. IMAGINATIONS OF UZBEK PEOPLE RELATED TO" GOOD" AND" BAD" TIME //Asian Journal of Multidimensional Research. – 2022. – Т. 11. – №. 8. – С. 66-69.

25. Саримсоков А. А. Традиционные календарные взгляды узбеков //Ученый XXI века. – 2020. – №. 1 (60). – С. 24-29.

26. Egamberdiyev, B. (2026). O 'ZBEKISTONDA MAHALLIY ODATLAR VA MAROSIMLARNING SHAKLLANISHI VA ULARNING FALSAFIY-TARIXIY MOHIYATI. Ижтимоий-гуманитар фанларнинг долзарб муаммолари Актуальные проблемы социально-гуманитарных наук Actual Problems of Humanities and Social Sciences., 6(1), 75-82.

27. Ваходир о'ғ'ли, Е. В. (2025, December). O'ZBEK XALQINING AN'ANAVIY MAROSIM VA URF-ODATLARINING TARIXIY ASOSLARI VA RIVOJLANISH

FALSAFIY TAHLILI (QADIMGI DAVR, ISLOM DAVRI MISOLIDA). In Partner conferences of the International Scientific Journal Research Focus (Vol. 1, No. 1, pp. 20-24).

28. Rahimberdiyev, S. (2026). KOREYA RESPUBLIKASIDA O 'ZBEK MIGRANTLARINING MADANIY IDENTIFIKATSIYASI: TRANSMILLIY JARAYON VA KUNDALIK HAYOT DINAMIKASI. Universal xalqaro ilmiy jurnal, 3(3.1), 434-440.

29. Bekmurod o'g'li, R. S. (2025, December). KOREYADAGI O 'ZBEKISTONLIK MEHNAT MIGRANTLARINING IJTIMOYIY HOLATI VA MADANIY IDENTIFIKATSIYA JARAYONLARI. In Partner conferences of the International Scientific Journal Research Focus (Vol. 1, No. 1, pp. 108-111).

30. Yusupov, D. S. O. (2021). The stages of creation smart clothing and electronic garments. Science and Education, 2(4), 163-165.

31. Gulbaxor, M., & Bahodir, S. (2025). TIL O 'RGANISHDA CHATGPT, TARJIMA TIZIMLARI VA ULARNING SAMARADORLIGI. TADQIQOTLAR, 76(3), 17-21.

32. Muzaffar, G., & Bahodir, S. (2025). INSON ORGANIZMIDA UCHRAYDIGAN ICHKI KASALIKLAR. TADQIQOTLAR, 76(2), 71-74.

33. Bahodir, S., & Dilshoda, R. (2025). EASTERN THINKERS OF THE ERA OF THE FIRST RENAISSANCE. Global Science Review, 8(1), 682-687.

34. Zebo, N., & Bahodir, S. (2025). O 'RTA ASRLARDA ANGLIYA (V-XV ASRLAR). Global Science Review, 11(1), 85-90.

35. Шамсиддинов, Б., & Гуламов, М. (2023). ЛОГИЧЕСКИЕ СООТНОШЕНИЯ ФИЛОСОФИИ С ЛИТЕРАТУРОЙ. Oriental Art and Culture, 4(3), 332-335.

36. Kozimjon o'g, N. M. K. (2026). BUXORO AMIRI AMIR NASRULLONING SIYOSIY FAOLIYATI MAHALLIY VA HORIJIIY MANBALAR ASOSIDA. TADQIQOTLAR, 79(2), 2850291-2850291.

37. Kozimjon o'g, N. M. K. (2025). RUSLAR TOMONIDAN XIVA XONLIGINING BOSIB OLINISHI TARIXIY MANBALAR TAHLILI ASOSIDA II-QISIM. INTERNATIONAL JOURNAL OF INTEGRATED SCIENCES, 1(1).

38. Kozimjon o'g, N. M. K. (2025). TOSHKENTNING ROSSIYA IMPERIYASI TOMONIDAN BOSIB OLINISHI. FARS International Journal of Education, Social Science & Humanities., 13(7), 47-53.

39. Kozimjon o'g, N. M. K., & Baxtiyor o'g'li, A. M. (2025). O 'RTA OSIYODA MA'RIFAT VA MILLIY UYG 'ONISH G 'OYALARI: MAHMUDXO 'JA BEHBUDIY FAOLIYATI MISOLIDA. Modern education and development, 36(2), 104-110.

40. Kozimjon o'g, N. M. K. (2025). THE ESTABLISHMENT OF THE KHOREZM PEOPLE'S SOVIET REPUBLIC. Universal Science Perspectives International Scientific Practical Journal, 1(1).

41. Kozimjon o'g, N. M. K. (2025). THE ESTABLISHMENT OF THE BUKHARA PEOPLE'S SOVIET REPUBLIC. INTERNATIONAL JOURNAL OF INTEGRATED SCIENCES, 1(1).

42. Murodjon o'g'li, I. S., & Kozimjon o'g, N. M. K. (2025). XIX-ASR BIRINCHI YARIMIDAN XX-ASR IKKINCHI YARIMIGACHA O'RTA OSIYODA YUZBERGAN INGLIZ-RUS RAQOBATIDA XONLIKLARNING AHAMIYATI. IMRAS, 8(5), 138-147.