the user or further components. For this, various new technologies are being explored to enable smart fabrics to measure the desired properties. In this field, a significant concern are strain sensors, as they are crucial for measuring the activity of the human body[9]. While flexible strain sensors are already commercially available, stretchable strain sensors represent a new level of wearability, as most fabrics and wearables are stretchable themselves. Trung et al.[29] built a very easily attachable, intrinsically stretchable, and transparent strain sensor from multiple layers of different polymers to measure strain and temperature. Souri et al.[25] provide an overview of additional wearable strain sensing technologies, including some utilizing carbon nanotubes, nanofibers, conductive polymers, and strain sensors in the form of optical fibers, among others.

This work focuses on the development of a highly scalable, modular robotic fabric incorporating flexible strain sensors. While most papers in this domain focus on creating a single sensor to be integrated into its area of operation, this work presents an adaptable and easily reproducible strain sensor, along with an approach to a scalable network comprising multiple sensors. Scalable sensor networks are crucial for smart fabric applications, as sensors in smart fabrics, in theory, often offer a high sensor density that needs to be supported by a network to read and process all these measurements. There is literature about easily scalable network topologies to be used for such a network to optimize area coverage while using as few nodes as possible and keeping network integrity at a high level[3, 28].

Similar work

Wu et al.[31] construct a stretchable strain sensor from a laser-cut and partially electroplated carbon fiber reinforced polymer. With these sensors, they build a smart fabric consisting of 5 sensors and a compute node in the form of a glove, shown in Fig.2.3a. The compute node reads all the strain sensors, interprets the values of the finger sensors, translates them into words, emits the translation through text-to-speech (TTS) synthesis, and transmits the translation wirelessly over Bluetooth to another computer for human confirmation. Their work involves the reading of multiple sensors by a compute node located on the fabric, transmitting results to a computer for further processing. However, it lacks intra-fabric networking and scalability, though scalability beyond 2 gloves would most likely not be necessary.

Luo et al.[15] developed an easily scalable and highly adaptable sensor array using fiberglass roving coated with multi-walled carbon nanotubes, which was further processed. The resulting fiber can be woven into fabrics and acts as a single sensor. This makes