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DISSERTATION TITLE:	*Programming Wireless Sensor Networks: From Static to Adaptive Models*

Scientific Summary (English):

Wireless Sensor Networks (WSNs) are of growing importance for the future of computer science and the vision of ubiquitous computing. They are rapidly being used in cyber-physical and ubiquitous applications such as healthcare, military and environmental monitoring. The nodes of WSNs must be able to operate unattended for long periods of time, especially when deployed in inaccessible places. The main focus of this thesis is on addressing programming support for the development of such applications. In particular, the thesis proposes a reference model supporting programming, dynamic reprogramming, and software adaptation in WSNs.

The reference model implements the main actions required to support adaptivity and reconfigurability in WSN application software. These actions include: i) monitoring contextual changes in the homogenous and heterogeneous WSN applications, ii) reasoning about the required software adaptation according to the processed context information, and iii) reconfiguring the application software based on the decided adaptation. Additionally, the proposed model is enriched with a framework that enables integration of WSNs into conventional distributed systems so that different node types can interact each other in a unified way based on a widely-accepted communication model.

The programming model proposed to address the above challenges is central to the results achieved by this thesis. This component-based programming model, called Remora, aims at not only simplifying software development for embedded and WSN applications, but also providing the primitives required for efficient dynamic reprogramming and software adaptivity in WSNs. Involving PC-based developers in WSN programming and facilitating application development for other types of embedded systems are two other motivations for proposing Remora.

Scientific Summary (Norwegian):

Wireless Sensor Networks (WSNs) er av økende betydning i fremtiden for informatikk og visjonen om allestedsnærværende databehandling. De blir i stadig økende grad brukt i applikasjoner i helsevesen,militæret og og i overvåkning av miljøet. Enhetene i WSN må være i stand til å operere i lange perioder alene; spesielt når de er plassert på steder uten fysisk tilgang. Hoved fokuset i denne avhandlingen er å omtale støtte for utvikling av slike programmer. Spesielt omtaler denne avhandlingen en referanse modelf or å støtte

programmering,dynamisk reporgrammering og programmvare tilpassninger i WSN's. Denne modellen implementerer hoved delene som er nødvendig for for å støtte programvare tilpassningene i WSN applikasjonene, blandt annet: i) å overvåke kontekstuelle endringer i dynamiske WSN applikasjoner, ii) Forslag om nødvendig programvare tilpasninger i henhold til behandlet kontekst informasjonen, iii) Omskrivning av applikasjonen basert på vedtatte endringene. I tilegg inneholder den foreslåtte modellen et distribusjons rammeverk som integrerer WSN's inn i konvensjonelle distribuerte systemer basert på en enhetlig kommunikasjon modell. For effektivt å møte de nevnte utfordringer forslår avhandlingen et ressurs effektivt komponent basert programmerings model for WSN's og innebygde system kalt Remora. Denne programmersings modellen har som mål å forenkle programvare utvikling for WSN's og og gi primitiver som kreves for effektiv dynamisk reprogrammering og programvare tilpassninger i WSN's.