Wafer-Level Assembly of Hybrid Microsystems

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The assembly of microparts directly onto micromachined silicon wafers allows one to design MEMS devices using incompatible microfabrication processes and to develop truly 3D microsystems. The drawback, however, is the microassembly step. Microassembly tasks differ from their macro counterparts primarily due to two reasons: very high precision requirements and the vastly different physics that dominate in the micro domain. These two differences indicate that sensor based manipulation strategies are required. For example, the current state-of-the art in the manufacture of microdevices requiring complex manipulation entails hand assembly using an optical microscope and probes or small tweezers, a very costly manufacturing step. In this talk two different types of wafer-level microassembly tasks will be presented. In the first, electroplated parts are assembled onto micromachined silicon wafers using visual servoing strategies. In the second task, self-assembly strategies are exploited to develop electromagnetic microactuators for dual-stage disk drives.