

# Table of contents

|   | page      |
|---|-----------|
| <b>Introduction.....</b>  | <b>3</b>  |
| <b>Management Summary .....</b>   | <b>5</b>  |
| <b>1 Foundations and Basic Technologies .....</b>   | <b>7</b>  |
| <b>1.1 Wearable Computing .....</b>   | <b>7</b>  |
| 1.1.1 Fields of Applications covered by the <b>wearIT@work</b> Project.....                   | 10        |
| 1.1.1.1 Production.....   | 10        |
| 1.1.1.1 Emergency Response.....   | 15        |
| 1.1.1.1 Healthcare.....   | 17        |
| 1.1.2 Components of Wearable Computing Systems.....   | 19        |
| <b>1.2 Augmented Reality.....</b>   | <b>23</b> |
| 1.2.1 Main Fields of Applications .....   | 25        |
| 1.2.2 Components of Augmented Reality Systems .....   | 28        |
| 1.2.2.1 Computer Internal Data Model.....   | 29        |
| 1.2.2.2 Computing System.....   | 31        |
| 1.2.2.3 Display Devices.....  | 33        |
| 1.2.2.4 User Interaction Devices .....  | 34        |
| 1.2.2.5 Tracking Technologies.....  | 35        |
| 1.3 Relationships: Wearable Computing and Augmented Reality.....                              | 38        |
| <b>2 From Wearable Computing to Augmented Reality</b><br><b>- A Systematic Approach .....</b> | <b>41</b> |
| <b>2.1 Application and Requirements Analysis .....</b>  | <b>43</b> |
| 2.1.1 Application Comprehension .....   | 43        |
| 2.1.2 Application Analysis .....  | 45        |
| 2.1.3 Analysis of Technological Feasibility .....   | 45        |
| 2.1.4 Analysis of Economical Feasibility .....  | 46        |
| <b>2.2 Conceptual Design.....</b>   | <b>46</b> |
| 2.2.1 Definition of Content .....   | 46        |
| 2.2.2 Definition of Interaction .....   | 47        |
| 2.2.3 Specification of the System Architecture.....   | 48        |

|   |    |
|---|----|
| 2.3 Implementation and Component Test .....   | 48 |
| 2.3.1 Modification of Data Management .....   | 48 |
| 2.3.2 Data Production .....   | 49 |
| 2.3.3 Modification of Information Presentation.....   | 50 |
| 2.3.4 Modification of Tracking .....  | 50 |
| 2.3.5 Modification of Interaction .....   | 51 |
| 2.4 Integration, Test Operation and Maintenance .....   | 51 |
| <b>3 <i>Conceptual Design of Wearable Augmented Reality Applications for the wearIT@work Scenarios.</i></b> ..... | 53 |
| 3.1 Production Scenario .....   | 53 |
| 3.1.1 Context-sensitive and Spatial Augmentation of Training Environment .....                                    | 53 |
| 3.1.1.1 Phase 1 “Application and Requirements Analysis” .....   | 54 |
| 3.1.1.2 Phase 2 “Conceptual Design” .....   | 59 |
| 3.1.2 Context-sensitive and Spatial Collaboration with Trainer and Trainee.....                                   | 60 |
| 3.2 Healthcare Scenario .....   | 63 |
| 3.3 Maintenance Scenario .....  | 64 |
| 3.3.1 Context-sensitive and Spatial Augmentation of Maintenance Environment .....                                 | 64 |
| 3.3.2 Context-sensitive and Spatial Collaboration with Maintenance Operator and Remote Expert.....                | 66 |
| 3.4 Emergency Scenario .....  | 67 |
| <b>References .....</b>   | 73 |
| <b>Authors.....</b>   | 79 |