**Raw data of user studies**

Table 1. Recognition Results of the Two Perception Experiments

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Experiment 1 (height of each unit: 5.6 mm) | | | | | | | | | | | | | | |
| True Shapes | **Perceived Shapes by Each Subject** | | | | | | | | | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** |
| S | S | S | S | S | S | S | S | R | S | S | S | S | S | S |
| E | T | R | R | P | E | E | E | E | E | R | P | E | E | P |
| R | P | R | R | R | R | R | P | R | R | R | R | R | R | R |
| P | P | R | P | T | P | P | P | P | P | P | P | P | P | P |
| T | T | T | T | T | T | T | T | P | T | T | T | T | T | T |
|  | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| Experiment 2 (height of each unit: 8.1 mm) | | | | | | | | | | | | | | |
| True  Shapes | **Perceived Shapes by Each Subject** | | | | | | | | | | | | | |
| **1** | **2** | **3** | **3** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** |
| S | S | S | R | S | S | S | S | S | S | S | S | S | S | S |
| E | E | S | P | E | E | E | E | E | E | E | E | E | E | E |
| R | R | R | R | R | R | R | S | R | R | R | R | R | R | R |
| P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| T | T | T | T | T | T | T | T | T | T | T | T | T | T | T |
| S: Square, E: Ellipse, R: Rectangle, P: Parallelogram, T: Triangle | | | | | | | | | | | | | | |

Table . Time Cost Results of Identifying Each Shape in the Two Perception Experiments.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Experiment 1 (height of each unit: 5.6 mm) | | | | | | | | | | | | | | | | |
| Shapes | **Time Cost of Perceiving Each Shape by Each Subject (s)** | | | | | | | | | | | | | |  | |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **mean** | **sd** |
| S | 8 | 15 | 45 | 15 | 10 | 5 | 8 | 52 | 15 | 8 | 9 | 4 | 6 | 11 | 15.1 | 14.7 |
| E | 20 | 44 | 90 | 30 | 50 | 11 | 80 | 60 | 40 | 124 | 58 | 21 | 26 | 32 | 49.0 | 31.4 |
| R | 16 | 40 | 45 | 25 | 27 | 5 | 43 | 67 | 10 | 8 | 12 | 27 | 3 | 12 | 24.3 | 18.7 |
| P | 20 | 18 | 18 | 19 | 14 | 9 | 20 | 62 | 30 | 8 | 6 | 24 | 8 | 8 | 18.9 | 14.3 |
| T | 13 | 16 | 150 | 36 | 20 | 7 | 14 | 17 | 27 | 6 | 12 | 11 | 6 | 17 | 25.1 | 36.9 |
| mean | 15.4 | 26.6 | 69.6 | 25.0 | 24.2 | 7.4 | 33.0 | 51.6 | 24.4 | 30.8 | 19.4 | 17.4 | 9.8 | 16.0 | 26.5 | - |
| sd | 5.1 | 14.2 | 51.8 | 8.4 | 15.8 | 2.6 | 29.4 | 20.1 | 12.0 | 52.1 | 21.7 | 9.6 | 9.2 | 9.5 | - | 27.0 |
|  | | | | | | | | | | | | | | |  |  |
|  | | | | | | | | | | | | | | |  |  |
| Experiment 2 (height of each unit: 8.1 mm) | | | | | | | | | | | | | | | | |
| Shapes | **Time Cost of Perceiving Each Shape by Each Subject (s)** | | | | | | | | | | | | | |  | |
| **1** | **2** | **3** | **3** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **mean** | **sd** |
| S | 8 | 7 | 16 | 2 | 9 | 3 | 7 | 9 | 6 | 2 | 5 | 2 | 2 | 9 | 6.2 | 4.0 |
| E | 20 | 60 | 50 | 17 | 49 | 8 | 27 | 15 | 12 | 64 | 60 | 14 | 10 | 19 | 30.4 | 21.1 |
| R | 9 | 45 | 30 | 7 | 12 | 5 | 23 | 15 | 6 | 9 | 4 | 5 | 5 | 6 | 12.9 | 12.0 |
| P | 10 | 25 | 9 | 4 | 5 | 4 | 6 | 13 | 8 | 2 | 2 | 6 | 3 | 5 | 7.3 | 6.0 |
| T | 10 | 40 | 26 | 2 | 38 | 4 | 3 | 27 | 10 | 6 | 3 | 8 | 2 | 8 | 13.4 | 13.5 |
| mean | 11.4 | 35.4 | 26.2 | 6.4 | 22.6 | 4.8 | 13.2 | 15.8 | 8.4 | 16.6 | 14.8 | 7.0 | 4.4 | 9.4 | 14.0 | - |
| sd | 4.9 | 20.2 | 15.7 | 6.3 | 19.6 | 1.9 | 11.0 | 6.7 | 2.6 | 26.7 | 25.3 | 4.5 | 3.4 | 5.6 | - | 15.2 |
| S: Square, E: Ellipse, R: Rectangle, P: Parallelogram, T: Triangle | | | | | | | | | | | | | | |  |  |

Table 3. Results of NASA-TLX Questionnaire

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dimension | Subjects | | | | | | | | | | | | | |  | |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **mean** | **sd** |
| Physical | 0 | 0 | 35 | 5 | 5 | 0 | 0 | 30 | 10 | 0 | 0 | 10 | 0 | 10 | 7.5 | 11.4 |
| Mental | 0 | 30 | 35 | 5 | 10 | 0 | 10 | 30 | 50 | 100 | 10 | 50 | 30 | 20 | 27.1 | 26.8 |
| Temporal | 0 | 0 | 25 | 5 | 5 | 0 | 0 | 10 | 10 | 0 | 0 | 0 | 0 | 10 | 4.6 | 7.2 |
| Own performance | 50 | 40 | 60 | 30 | 45 | 10 | 45 | 50 | 25 | 40 | 10 | 0 | 20 | 40 | 33.2 | 17.8 |
| Effort | 10 | 10 | 25 | 5 | 45 | 0 | 50 | 50 | 0 | 80 | 0 | 0 | 20 | 50 | 24.6 | 25.8 |
| Frustration | 0 | 0 | 35 | 5 | 5 | 0 | 0 | 30 | 10 | 0 | 0 | 10 | 0 | 10 | 4.3 | 10.7 |
| mean | 10.0 | 13.3 | 30.8 | 8.3 | 19.2 | 1.7 | 17.5 | 30.0 | 15.8 | 43.3 | 3.3 | 10.0 | 11.7 | 21.7 | 16.9 | - |
| sd | 20.0 | 17.5 | 18.0 | 10.8 | 20.1 | 4.1 | 23.6 | 17.9 | 19.1 | 40.8 | 5.2 | 20.0 | 13.3 | 19.4 | - | 21.3 |