Environment Design to Sustain Users - Workshop 23

John McGrory
Technological University Dublin, john.mcgrory@tudublin.ie

Matteo Zallio
Technological University Dublin, matteo.zallio@tudublin.ie

Follow this and additional works at: https://arrow.tudublin.ie/engscheleart

Recommended Citation

This work is licensed under a Creative Commons Attribution-Noncommercial-Share Alike 4.0 License
Funder: http://www.aal-europe.eu/
Workshop 23
Environment Design to Sustain Users

AAL Forum 2016
26-28 September 2016
St. Gallen, Switzerland

Dr John McGrory
Dublin Institute of Technology

Dr Matteo Zallio
Dublin Institute of Technology

© Dr John McGrory & Dr Matteo Zallio 2016
Ecosystem - People

- Home
- Work
- Social Groups
- Family

Connections
- Interfaces
- Emotional
- Direct sensory

Utility Company

Road terrain & other vehicles/people

© Dr John McGrory & Dr Matteo Zallio 2016
Ecosystem - Homes

Overlap or Common Patterns
How do we identify it, personalise it, conceptualise it, act on it

Form, Fit Function
System Patterns - Example

- Flood Light Fitting
- Light Detection (Darkness)
- Presence Detection
- Industrial Integrated Solution

© Dr John McGrory & Dr Matteo Zallio 2016
Now
Individual key
Adjust seat
Adjust control sensitivity

These common patterns have weightings and context for individuals

Offer customised personalised experience
Ecosystem Deviation Population

A person’s “connection” to the ecosystem is based on a number of factors:

- **Gender**
  - Woman
  - Man
  - Unknown

- **Ethnicity**
  - Shared cultural heritage, ancestry, history, homeland, language or ideology.

- **Age**
  - 0 to 150!

- **Education**
  - Level: Kindergarten to PhD and discipline Nursing, Engineering, hospitality.

- **Experience**
  - Experience is something you get after you need it. Theoretical or practical. Low or high level.

- **Physical and Mental**
  - Physical: (Visual, Hearing, Smell, etc.) and mental ability.

Every one of these and many other factors affects the individual’s “connection”.

© Dr John McGrory & Dr Matteo Zallio 2016
Perfect User Experience in Sustainable Design?

So you want me to show you a **perfect user experience in sustainable design** that is suited to every member of the population equally?

Now **YOU** are talking Fantasy and Fiction!

But we will show you today some tricks and knowledge you need to employ, so **YOU**…yes…**YOU** can be better prepared.
Discussion of Systems

Traditionally Wired System
On/Off and Analogue

Fieldbus Wired System

Intelligent Wired System

Warning
Simplistic View
To show issues and concepts

© Dr John McGrory & Dr Matteo Zallio 2016
Traditionally Wired System – On/Off

Steps:
1. Place the components switch and light
2. Place the wiring
3. Label the system.

Hence a basic lighting circuit.
The switch turns on the light

Warning
Cheap & Easy
But
Reuse/multiuse of signal?
Individual preferences
On/Off Sensor **Switch** Concept

- **Push to make**
- **Push to break**

**Single pole**
- Single way or throw

**Double pole**
- Single way or throw

**Passive infrared-motion sensor block diagram**
- Fresnel lens
- PIR
- Amplifier
- Comparator
- Output

- Thermal energy
- IR filter

© Dr John McGrory & Dr Matteo Zallio 2016
On/Off Actuator Concept

Blinds

Doors, Gates, Fans

© Dr John McGrory & Dr Matteo Zallio 2016
User in Traditionally Wired

Title: __________
Activity: __________
Location: __________

Jane moved in bed
John stepped out of bed
James moved in a room
Traditionally Wired System - Analogue

Steps:
1. Place the components dimmer and light
2. Place the wiring
3. Label the system.

Hence a basic lighting circuit. The switch turns on the light.

Warning
Cheap & Easy
But
Reuse/multiuse of signal?
Individual preferences
Analogue Sensor Concept - Examples

Warning
Could vary Voltage, Resistance or Current to do the same thing.
Analogue Actuator Concept - Examples
Fieldbus Concept - Simplified

Circuit 1

10010101 1100101 10010101

On,Off,Off,On,Off,On,Off,On

This is the default baud rate of the switch.
### ASCII

<table>
<thead>
<tr>
<th>Dec</th>
<th>Hex</th>
<th>Oct</th>
<th>Bin</th>
<th>Char</th>
<th>Dec</th>
<th>Hex</th>
<th>Oct</th>
<th>Bin</th>
<th>Char</th>
<th>Dec</th>
<th>Hex</th>
<th>Oct</th>
<th>Bin</th>
<th>Char</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>000</td>
<td>0</td>
<td>000000</td>
<td>NUL</td>
<td>32</td>
<td>020</td>
<td>040</td>
<td>0100000</td>
<td>space</td>
<td>64</td>
<td>040</td>
<td>100</td>
<td>1000000</td>
<td>@</td>
</tr>
<tr>
<td>1</td>
<td>001</td>
<td>0</td>
<td>000001</td>
<td>SOH</td>
<td>33</td>
<td>021</td>
<td>041</td>
<td>0100001</td>
<td>!</td>
<td>65</td>
<td>041</td>
<td>101</td>
<td>1000001</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>002</td>
<td>0</td>
<td>000002</td>
<td>STX</td>
<td>34</td>
<td>022</td>
<td>042</td>
<td>0100010</td>
<td>&quot;</td>
<td>66</td>
<td>042</td>
<td>102</td>
<td>1000010</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>003</td>
<td>0</td>
<td>000003</td>
<td>ETX</td>
<td>35</td>
<td>023</td>
<td>043</td>
<td>0100011</td>
<td>#</td>
<td>67</td>
<td>043</td>
<td>103</td>
<td>1000011</td>
<td>C</td>
</tr>
<tr>
<td>4</td>
<td>004</td>
<td>0</td>
<td>000004</td>
<td>EOT</td>
<td>36</td>
<td>024</td>
<td>044</td>
<td>0100100</td>
<td>$</td>
<td>68</td>
<td>044</td>
<td>104</td>
<td>1001000</td>
<td>D</td>
</tr>
<tr>
<td>5</td>
<td>005</td>
<td>0</td>
<td>000005</td>
<td>ENQ</td>
<td>37</td>
<td>025</td>
<td>045</td>
<td>0100101</td>
<td>%</td>
<td>69</td>
<td>045</td>
<td>105</td>
<td>1001010</td>
<td>E</td>
</tr>
<tr>
<td>6</td>
<td>006</td>
<td>0</td>
<td>000006</td>
<td>ACK</td>
<td>38</td>
<td>026</td>
<td>046</td>
<td>0100110</td>
<td>&amp;</td>
<td>70</td>
<td>046</td>
<td>106</td>
<td>1001100</td>
<td>F</td>
</tr>
<tr>
<td>7</td>
<td>007</td>
<td>0</td>
<td>000007</td>
<td>BEL</td>
<td>39</td>
<td>027</td>
<td>047</td>
<td>0100111</td>
<td>'</td>
<td>71</td>
<td>047</td>
<td>107</td>
<td>1001110</td>
<td>G</td>
</tr>
<tr>
<td>8</td>
<td>008</td>
<td>0</td>
<td>000010</td>
<td>BS</td>
<td>40</td>
<td>028</td>
<td>050</td>
<td>0101000</td>
<td>(</td>
<td>72</td>
<td>048</td>
<td>110</td>
<td>1010000</td>
<td>H</td>
</tr>
<tr>
<td>9</td>
<td>009</td>
<td>0</td>
<td>000011</td>
<td>TAB</td>
<td>41</td>
<td>029</td>
<td>051</td>
<td>0101001</td>
<td>)</td>
<td>73</td>
<td>049</td>
<td>111</td>
<td>1010001</td>
<td>I</td>
</tr>
<tr>
<td>10</td>
<td>00A</td>
<td>0</td>
<td>000101</td>
<td>LF</td>
<td>42</td>
<td>02A</td>
<td>052</td>
<td>0101010</td>
<td>*</td>
<td>74</td>
<td>04A</td>
<td>112</td>
<td>1010100</td>
<td>J</td>
</tr>
<tr>
<td>11</td>
<td>00B</td>
<td>0</td>
<td>000110</td>
<td>VT</td>
<td>43</td>
<td>02B</td>
<td>053</td>
<td>0101011</td>
<td>+</td>
<td>75</td>
<td>04B</td>
<td>113</td>
<td>1010101</td>
<td>K</td>
</tr>
<tr>
<td>12</td>
<td>00C</td>
<td>0</td>
<td>001000</td>
<td>FF</td>
<td>44</td>
<td>02C</td>
<td>054</td>
<td>0110000</td>
<td>,</td>
<td>76</td>
<td>04C</td>
<td>114</td>
<td>1011000</td>
<td>L</td>
</tr>
<tr>
<td>13</td>
<td>00D</td>
<td>0</td>
<td>001001</td>
<td>CR</td>
<td>45</td>
<td>02D</td>
<td>055</td>
<td>0110010</td>
<td>.</td>
<td>77</td>
<td>04D</td>
<td>115</td>
<td>1011010</td>
<td>M</td>
</tr>
<tr>
<td>14</td>
<td>00E</td>
<td>0</td>
<td>001010</td>
<td>SO</td>
<td>46</td>
<td>02E</td>
<td>056</td>
<td>0110011</td>
<td>;</td>
<td>78</td>
<td>04E</td>
<td>116</td>
<td>1011011</td>
<td>N</td>
</tr>
<tr>
<td>15</td>
<td>00F</td>
<td>0</td>
<td>001011</td>
<td>SI</td>
<td>47</td>
<td>02F</td>
<td>057</td>
<td>0110111</td>
<td>/</td>
<td>79</td>
<td>04F</td>
<td>117</td>
<td>1011101</td>
<td>O</td>
</tr>
<tr>
<td>16</td>
<td>010</td>
<td>0</td>
<td>010000</td>
<td>DLE</td>
<td>48</td>
<td>030</td>
<td>060</td>
<td>0110000</td>
<td>0</td>
<td>80</td>
<td>050</td>
<td>120</td>
<td>1100000</td>
<td>P</td>
</tr>
<tr>
<td>17</td>
<td>011</td>
<td>0</td>
<td>010001</td>
<td>DC1</td>
<td>49</td>
<td>031</td>
<td>061</td>
<td>0110001</td>
<td>1</td>
<td>81</td>
<td>051</td>
<td>121</td>
<td>1100001</td>
<td>Q</td>
</tr>
<tr>
<td>18</td>
<td>012</td>
<td>0</td>
<td>010010</td>
<td>DC2</td>
<td>50</td>
<td>032</td>
<td>062</td>
<td>0110010</td>
<td>2</td>
<td>82</td>
<td>052</td>
<td>122</td>
<td>1100100</td>
<td>R</td>
</tr>
<tr>
<td>19</td>
<td>013</td>
<td>0</td>
<td>010011</td>
<td>DC3</td>
<td>51</td>
<td>033</td>
<td>063</td>
<td>0110011</td>
<td>3</td>
<td>83</td>
<td>053</td>
<td>123</td>
<td>1100101</td>
<td>S</td>
</tr>
<tr>
<td>20</td>
<td>014</td>
<td>0</td>
<td>010100</td>
<td>DC4</td>
<td>52</td>
<td>034</td>
<td>064</td>
<td>0110100</td>
<td>4</td>
<td>84</td>
<td>054</td>
<td>124</td>
<td>1101000</td>
<td>T</td>
</tr>
<tr>
<td>21</td>
<td>015</td>
<td>0</td>
<td>010101</td>
<td>NAK</td>
<td>53</td>
<td>035</td>
<td>065</td>
<td>0110101</td>
<td>5</td>
<td>85</td>
<td>055</td>
<td>125</td>
<td>1101010</td>
<td>U</td>
</tr>
<tr>
<td>22</td>
<td>016</td>
<td>0</td>
<td>010110</td>
<td>SYN</td>
<td>54</td>
<td>036</td>
<td>066</td>
<td>0110110</td>
<td>6</td>
<td>86</td>
<td>056</td>
<td>126</td>
<td>1101100</td>
<td>V</td>
</tr>
<tr>
<td>23</td>
<td>017</td>
<td>0</td>
<td>011001</td>
<td>ETB</td>
<td>55</td>
<td>037</td>
<td>067</td>
<td>0111011</td>
<td>7</td>
<td>87</td>
<td>057</td>
<td>127</td>
<td>1110111</td>
<td>W</td>
</tr>
<tr>
<td>24</td>
<td>018</td>
<td>0</td>
<td>011000</td>
<td>CAN</td>
<td>56</td>
<td>038</td>
<td>070</td>
<td>0110000</td>
<td>8</td>
<td>88</td>
<td>058</td>
<td>130</td>
<td>1110000</td>
<td>X</td>
</tr>
<tr>
<td>25</td>
<td>019</td>
<td>0</td>
<td>011010</td>
<td>EM</td>
<td>57</td>
<td>039</td>
<td>071</td>
<td>0110100</td>
<td>9</td>
<td>89</td>
<td>059</td>
<td>131</td>
<td>1110100</td>
<td>Y</td>
</tr>
<tr>
<td>26</td>
<td>01A</td>
<td>0</td>
<td>011100</td>
<td>SUB</td>
<td>58</td>
<td>03A</td>
<td>072</td>
<td>0111000</td>
<td>;</td>
<td>90</td>
<td>05A</td>
<td>132</td>
<td>1111000</td>
<td>Z</td>
</tr>
<tr>
<td>27</td>
<td>01B</td>
<td>0</td>
<td>011101</td>
<td>ESC</td>
<td>59</td>
<td>03B</td>
<td>073</td>
<td>0111011</td>
<td>]</td>
<td>91</td>
<td>05B</td>
<td>133</td>
<td>1111011</td>
<td>[</td>
</tr>
<tr>
<td>28</td>
<td>01C</td>
<td>0</td>
<td>011110</td>
<td>FS</td>
<td>60</td>
<td>03C</td>
<td>074</td>
<td>0111100</td>
<td>^</td>
<td>92</td>
<td>05C</td>
<td>134</td>
<td>1111100</td>
<td>_</td>
</tr>
<tr>
<td>29</td>
<td>01D</td>
<td>0</td>
<td>011111</td>
<td>GS</td>
<td>61</td>
<td>03D</td>
<td>075</td>
<td>0111111</td>
<td>_</td>
<td>93</td>
<td>05D</td>
<td>135</td>
<td>1111110</td>
<td>`</td>
</tr>
<tr>
<td>30</td>
<td>01E</td>
<td>0</td>
<td>011110</td>
<td>RS</td>
<td>62</td>
<td>03E</td>
<td>076</td>
<td>0111111</td>
<td>^</td>
<td>94</td>
<td>05E</td>
<td>136</td>
<td>1111111</td>
<td>~</td>
</tr>
<tr>
<td>31</td>
<td>01F</td>
<td>0</td>
<td>011111</td>
<td>US</td>
<td>63</td>
<td>03F</td>
<td>077</td>
<td>0111111</td>
<td>?</td>
<td>95</td>
<td>05F</td>
<td>137</td>
<td>1111111</td>
<td>DEL</td>
</tr>
</tbody>
</table>

© Dr John McGrory & Dr Matteo Zallio 2016

A burst of 1001110 could equate to the alpha character N
Fieldbus Concept - Devices

- Unique Address
- Memory
- Logic
- Operating System

**Address: _______**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>X1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>X2</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Address: _______**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>X1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>X2</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

© Dr John McGrory & Dr Matteo Zallio 2016
Warning
One cable and reuse

Header 1010;1011
Body *=>1!
Trailer 1010;1011
Address: _______

Title:_______________
Activity::____________
Location::___________

Address: 1010

Memory

<table>
<thead>
<tr>
<th>Address</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>X0</td>
<td>0</td>
</tr>
<tr>
<td>X1</td>
<td>0</td>
</tr>
<tr>
<td>X2</td>
<td>0</td>
</tr>
</tbody>
</table>

Logic

OS

Title:_______________
Activity::____________
Location::___________

Address: 1001

Memory

<table>
<thead>
<tr>
<th>Address</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>X0</td>
<td>0</td>
</tr>
<tr>
<td>X1</td>
<td>0</td>
</tr>
<tr>
<td>X2</td>
<td>0</td>
</tr>
</tbody>
</table>

Logic

OS

Title:_______________
Activity::____________
Location::___________

Address: 1011

Memory

<table>
<thead>
<tr>
<th>Address</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>X0</td>
<td>0</td>
</tr>
<tr>
<td>X1</td>
<td>0</td>
</tr>
<tr>
<td>X2</td>
<td>0</td>
</tr>
</tbody>
</table>

Logic

OS

Title:_______________
Activity::____________
Location::___________

© Dr John McGrory & Dr Matteo Zallio 2016
Fieldbus Concept - Wireless

WIFI is frequency based - 2.4Ghz and 5Ghz

High, Low, Low, High, Low, High, Low, High

10010101 1100101 10010101

High or Low Frequency or Amplitude
Fieldbus Concept - Wireless

Header 1010;1011

Body *

Trailer 1010;1011

To Device ; From Device

Move First, Move Next, Make 1

To Device ; From Device

Warning

Over air

Address: 1010

Memory

Logic

OS

Address | Data
--- | ---
X0 | 0
X1 | 0
X2 | 0

Title: _______________
Activity:: __________
Location:: __________

Address: 1011

Memory

Logic

OS

Address | Data
--- | ---
X0 | 0
X1 | 0
X2 | 0

Title: _______________
Activity:: __________
Location:: __________

© Dr John McGrory & Dr Matteo Zallio 2016
Fieldbus Concept - Messages

- Simple 1 or 0 messages
- Hexadecimal messages
  But still transmitted as 1 or 0
- XML or JSON messages
  But still transmitted as 1 or 0

But this is only sending information. How is it intelligent!!!
Intelligence - Device

Robust and Reliable?
Not an app on a phone or PC

Where is it located?

How is the logic expressed?

When is it used?

How do we capture different users?

How do we capture different situations?

Warning
Every time a new device is added, it needs to be included in the big logic

Can this be different?

© Dr John McGrory & Dr Matteo Zallio 2016
In essence

One app does not exclusively own the screen function
Or battery, or vibration or calendar or alerts.
They reuse and share the functions through apps

In a similar way

One user does not exclusively own the fridge function
Or TV, or shower or front door or alerts.
They reuse and share the functions through intelligent ubiquitous interaction

© Dr John McGrory & Dr Matteo Zallio 2016
Thank you