



# **Expert System: Computer Port Identification System**

**Michael Vincent**

A digital version of this document is available at <https://github.com/mvinc17/ipt/blob/master/ES-1.pdf>.

Michael Vincent

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# 1 - Problem Definition

An Expert System (ES) was to be designed that was able to identify 20 or more different computer ports. The system in question is described in this document.

## 2 - Universe of Discourse (UoD)

In order to design the system in an efficient manner, a well defined UoD was created to define the boundaries of the system. The following information was included in the UoD:

<b>System Name</b>	Computer Port Identification System (CPIS)
<b>Conclusion Type</b>	Computer Port (Standard Name)
<b>Phrase to be used as a starting link at the beginning of the ES</b>	Identify a Computer Port
<b>A longer description of the ES on the home page of the ES</b>	There are various types of computer ports which are used for a wide array of purposes, from audio to video to printers. This ES will be designed to help people to identify the various ports which they may encounter through the use of an array of attributes including but not limited to colour, shape and number of pins.
<b>An image that will be displayed on the home page of the ES to improve presentation of the user interface</b>	 <p>Image Source: <a href="http://www.gigabyte.com/fileupload/product/2/4287/6579_big.jpg">http://www.gigabyte.com/fileupload/product/2/4287/6579_big.jpg</a></p>

### 3 - Design Decision Justification

Throughout the design of the ES, several decisions were made in order to optimise the system in terms of both speed, accuracy and ease of use.

The following attributes were used to identify the ports:

- Shape
- Pin Count
- Colour
- Has vertical row of pins
- Connector filled in
- Labelled with PCI-E Power

(see attribute table below for the data values of all of those attributes)

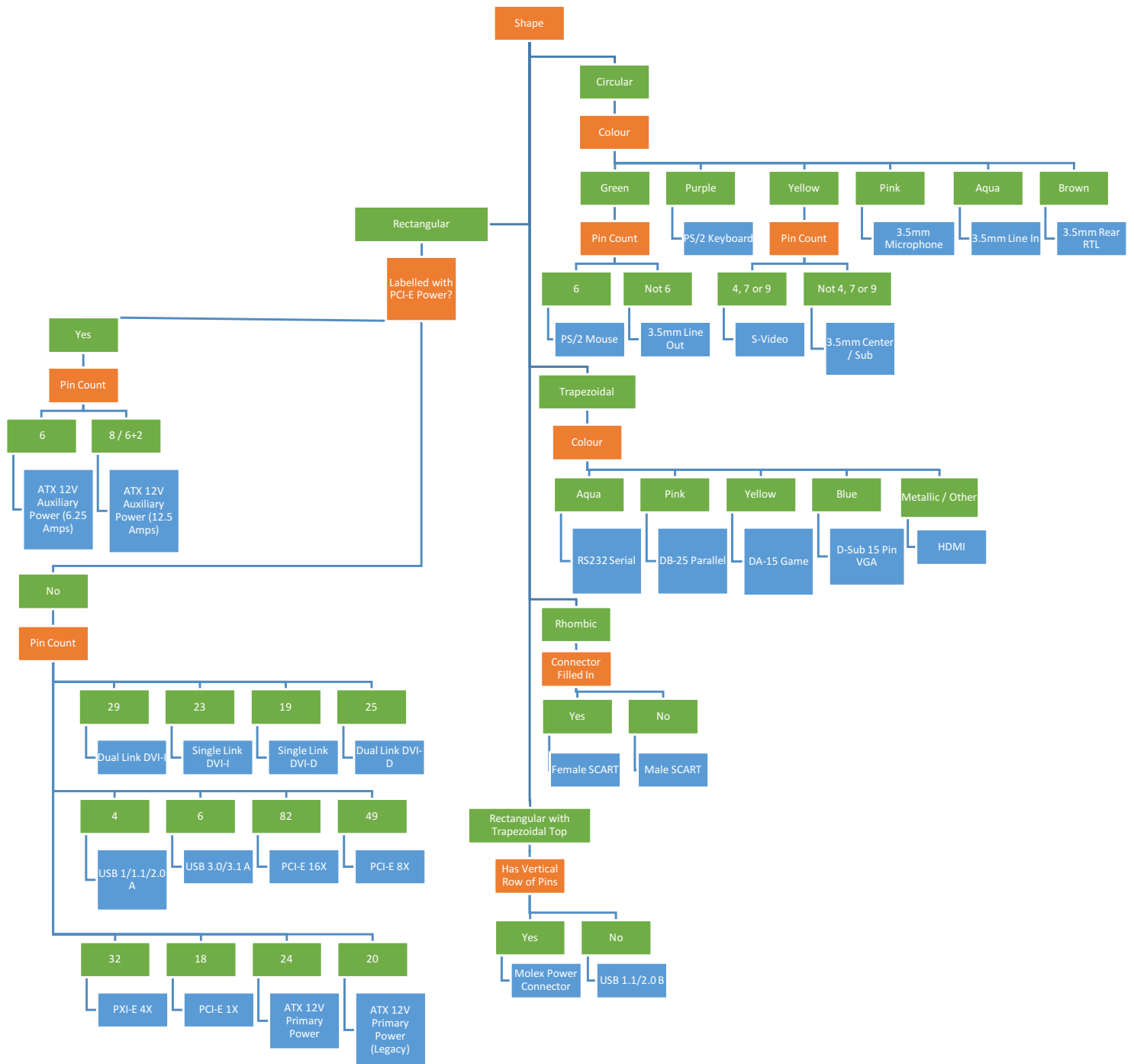
Shape	Colour	Pin Count	Filled In	Has row of pins in vertical middle	Labelled with PCI-E Power	Conclusion
Trapezoidal	Aqua	9	Yes	No	No	RS232 Serial
Trapezoidal	Pink	25	Yes	No	No	DB-25 Parallel
Trapezoidal	Yellow	15	Yes	No	No	DA-15 Game
Trapezoidal	Blue	15	Yes	No	No	D-Sub 15 Pin VGA
Trapezoidal	Metallic	19	No	Yes	No	HDMI
Round	Metallic	3	No	No	No	Male 3 Pin XLR
Round	Metallic	3	Yes	No	No	Female 3 Pin XLR
Round	Metallic	5	No	No	No	Male 5 Pin XLR
Round	Metallic	5	Yes	No	No	Female 5 Pin XLR
Round	Metallic	4	Yes	No	No	Female 3 Pin XLR / TRS Phone Combo
Round	Plastic Housing	5	No	No	No	32A 400V 3 Phase IEC 60309
Round	Plastic Housing	3 with 2 Shielded	No	No	No	240V 10A AS/ NZS 3112 (IEC Type I)
Rhombic	Metallic	21	No	No	No	Male SCART
Rhombic	Metallic	21	Yes	No	No	Female SCART
Rectangular with Trapezoidal Top	N/A	4	80%	No	No	USB 1.1/2.0 B
Rectangular with Trapezoidal Top	Plastic	4	No	Yes	No	Molex Power Connector
Rectangular	White	23	Yes	No	No	Single Link DVI-I
Rectangular	White	29	Yes	No	No	Dual Link DVI-I
Rectangular	White	19	Yes	No	No	Single Link DVI-D
Rectangular	White	25	Yes	No	No	Dual Link DVI-D
Rectangular	N/A	4	Half	Yes	No	USB 1/1.1/2.0 A
Rectangular	N/A	6	Half	Yes	No	USB 3.0/3.1 A
Rectangular	Plastic	82	No	No	No	PCI-E 16x

Shape	Colour	Pin Count	Filled In	Has row of pins in vertical middle	Labelled with PCI-E Power	Conclusion
Rectangular	Plastic	49	No	No	No	PCI-E 8x
Rectangular	Plastic	32	No	No	No	PCI-E 4x
Rectangular	Plastic	18	No	No	No	PCI-E 1x
Rectangular	Plastic	24	No	No	No	ATX 24 Pin Power
Rectangular	Plastic	20	No	No	No	ATX 20 Pin Power
Rectangular	Plastic	6	No	No	Yes	ATX 12V Auxiliary Power (6.25 Amps)
Rectangular	Plastic	8	No	No	Yes	ATX 12V Auxiliary Power (12.5 Amps)
Circular	Green	6	Yes	No	No	PS/2 Mouse
Circular	Purple	6	Yes	No	No	PS/2 Keyboard
Circular	Yellow	4, 7 or 9	Yes	No	No	S-Video
Circular	Pink	N/A	No	No	No	3.5mm Microphone
Circular	Aqua	N/A	No	No	No	3.5mm Line In
Circular	Green	N/A	No	No	No	3.5mm Line Out
Circular	Brown	N/A	No	No	No	3.5mm Rear RTL
Circular	Gold / Yellow	N/A	No	No	No	3.5mm Center / Sub

As part of the design process for the ES, it was necessary to decide the order of the attributes such that as many possibilities would be ruled out as soon as possible, and to minimise the number of questions which needed to be asked, leaving the most difficult questions until last so that a minimal number of possibilities were available.

Refer to the decision tree (below) for the order of the questions. The order of the questions was decided using the rationale below:


- The array of 31 connectors used contained 5 different shapes, and the shape was used as the first attribute to identify, since it would cut the connector count from 31 to an average of 6.2 connectors per shape.
- The next question asked either the colour of the connector, if it was labelled with “PCI-E Power”, if the connector was filled in or if the connector contained a vertical row of pins:
  - If the question was colour and the shape was trapezoidal, it was possible to conclude with one of 5 different connectors (RS232 Serial, DB-25 Parallel, DA-15 Game, D-Sub 15 Pin VGA or HDMI).
  - If the question was colour and the shape was circular, it was sometimes possible to determine a specific connector, otherwise another question was to be asked, connectors which could be specified just by being round and having a specific colour were PS/2 Keyboard, 3.5mm Microphone, 3.5mm Line In and 3.5mm RTL;
  - If the connector was not one of those which could be identified just by shape and colour, a further question was asked, which was the number of pins on the connector, the conclusions from this additional question resulted in the identification of the PS2/ Mouse, 3.5mm Line Out, S-Video and 3.5mm Centre / Sub connectors.
- If the question was “Labelled with PCI-E Power?”, an additional question needed to be asked, which was pin count:
  - If the connector was labelled with PCI-E power, then the results from the pin count with values of 6 and 8 (6+2) were ATX 12V Auxiliary (12.5 Amps) and ATX 12V Auxiliary (6.25 Amps) respectively.
  - If the connector was *not* labelled PCI-E power, then the results from the pin count with values of 23, 29, 19, 25, 4, 6, 82, 49, 32, 18, 24 or 20 were Single Link DVI-I, Dual Link DVI-I, Single Link DVI-D, Dual Link DVI-D, USB 1/1.1/2.0 A, USB 3.0/3.1 A, PCI-E 16x, PCI-E 8x, PCI-E 4x, PCI-E 1x, ATX 24 Pin Power and ATX 20 Pin Power respectively.
- If the question was “Has row of vertical pins” and was answered yes, it was concluded that the connector was a Male MOLEX Power connector, if no, the conclusion was that the connector was a USB 1.1/2.0 B port.
- If the question was “Connector filled in” and the answer was yes, then it was concluded that the connector was a Female SCART connector, otherwise if the answer was no, it was concluded that it was a Male SCART connector.





## 4 - User Interface Design

Since the system is designed to be used by non-experts, it is imperative that it should be easy to use, as such, the connector's name, description and an image (description and image using the Wikipedia API, so that changing content is kept up-to-date) will be displayed once the user has identified the connector:

<b>D-Sub 15 Pin VGA</b>		<p>A Video Graphics Array (VGA) connector is a three-row 15-pin DE-15 connector. The 15-pin VGA connector was provided on many video cards, computer monitors, laptop computers, projectors, and high definition television sets. On laptop computers or other small devices, a mini-VGA port was sometimes used in place of the full-sized VGA connector.</p>
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## 5 - Source of Expert Knowledge

The information used in the development of this system was found on either <https://en.wikipedia.org> or <http://pinouts.ru/>.