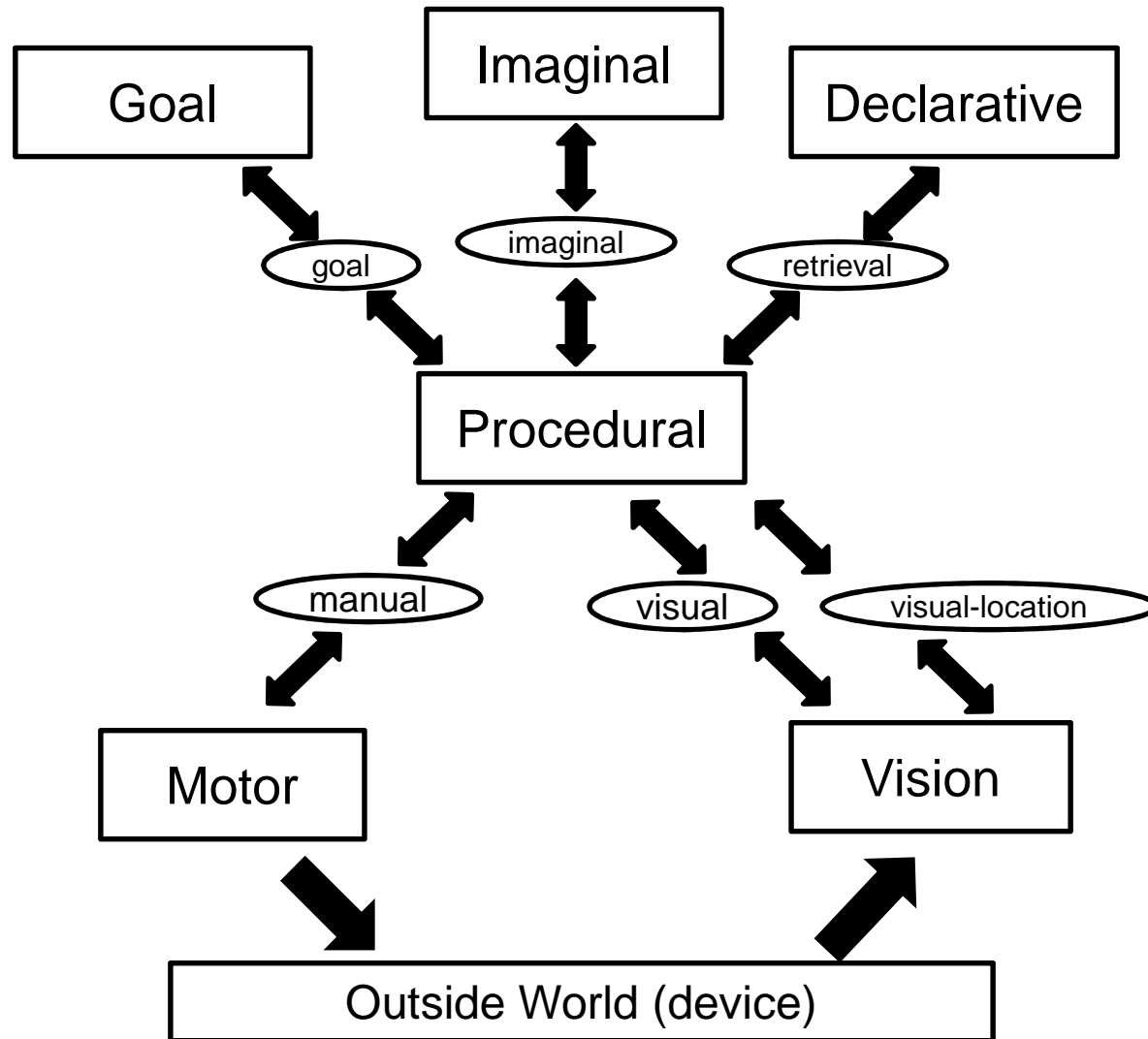

ACT-R overview

- A cognitive architecture
 - A set of special purpose modules
 - Declarative memory, procedural memory, motor control, vision, goals, etc
 - A description of how they are integrated
 - An association of modules to cortical regions
-

ACT-R 6 Overview



Unit 1 overview

- Introduction to knowledge structures
 - Two types of knowledge in ACT-R
 - Declarative
 - Procedural
-

Declarative knowledge

- Knowledge we are aware of
 - $3 + 4 = 7$
 - Cardinals are red birds
 - Represented in ACT-R by chunks
-

Chunks

- Defined by their type and slots
 - Type represents a category
 - Addition facts
 - Birds
 - Slots represent attributes
 - Addends and sum
 - Color and size
-

Procedural knowledge

- Knowledge displayed in behavior
 - Generally not consciously aware of it
 - Speaking a language
 - Driving a car with a manual transmission
 - learning productions from declarative in unit 7
 - Represented in ACT-R by productions
-

Productions

- A condition and action pair
 - If my goal is to answer $3 + 4$ and
I have a chunk that says $3 + 4 = 7$
then set the answer to 7
 - When the condition (left-hand side) is met
perform the actions (right-hand side)
 - Only one production at a time can fire
-

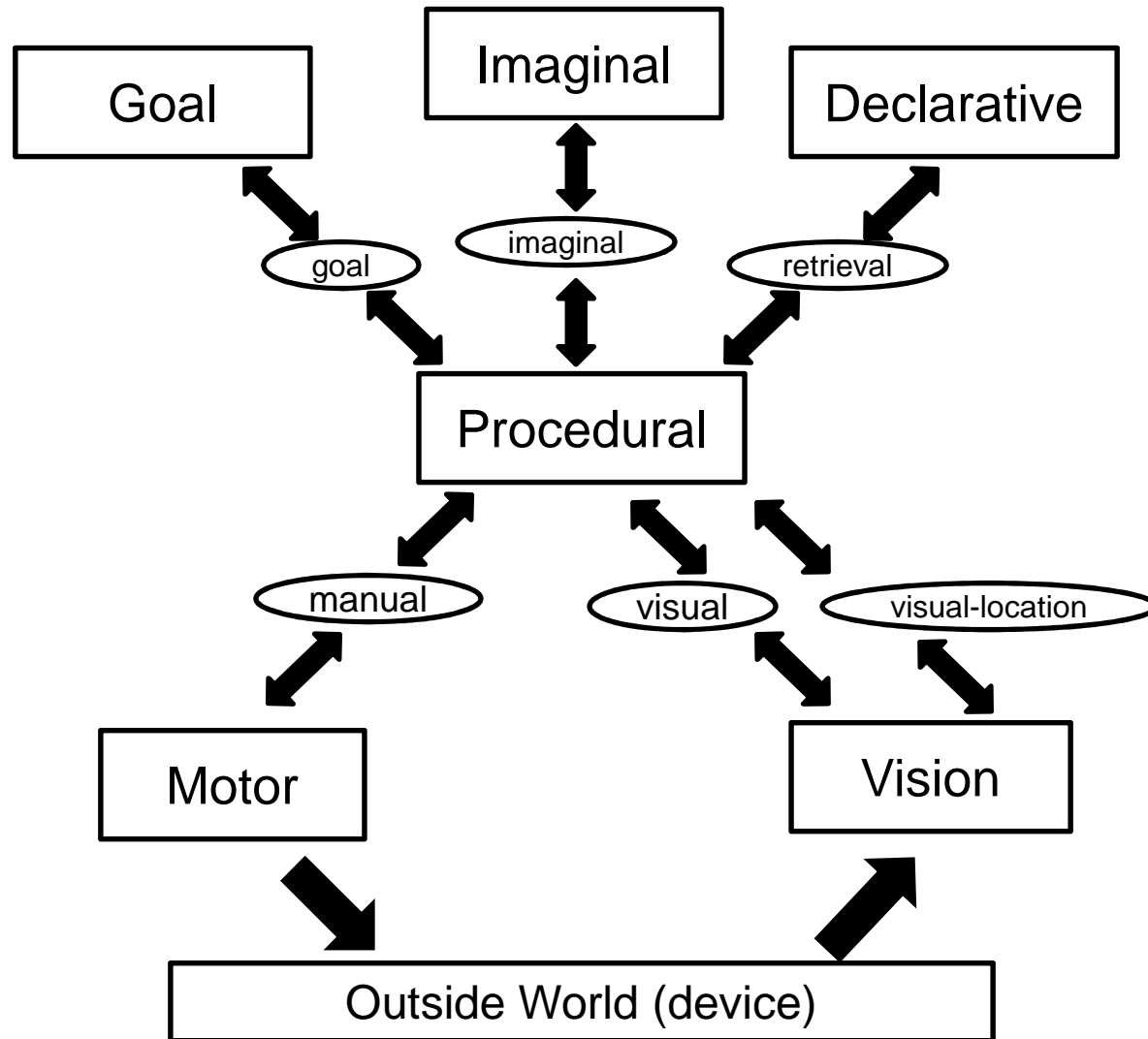
Productions (cont.)

- The conditions are a conjunction of tests
 - the contents of buffers
 - the state of the buffers
 - The state of the modules
 - The actions perform
 - changes to the buffers
 - requests of the modules
 - What is a buffer?
-

Buffers

- A buffer is the interface to a module
 - Responds to queries about state of the module or buffer
 - Accepts requests for the module
 - Can hold one chunk
 - Typically placed there in response to a request
 - Scratch pad for chunk creation
-

ACT-R 6 Overview



Conditions (LHS)

- Buffer tests specify a buffer and pattern

```
=goal>  
  isa find-sum  
  addend1 =a1  
  addend2 =a2
```

- Buffer queries specify a buffer and state-value pairs to check

```
?retrieval>  
  state free  
  buffer empty
```

- If all patterns match and all queries are true the production may be selected and fired
-

Actions (RHS)

- Three types of actions:
 - Clear the chunk from the buffer
 - Specified with a – before the buffer name

```
-goal>
```
 - Modify the chunk in the buffer
 - Specified with an = before the buffer name and followed by slot-value pairs indicating the changes to make

```
=goal>  
answer =sum
```
 - Request the module do something
 - Specified with a + before the buffer name followed by a description of the action to perform
 - Implicitly clears any chunk in the buffer

```
+retrieval>  
isa add-fact
```
-

Motor Module

- ACT-R's hands
 - Can manipulate a keyboard or mouse
 - Other “devices” can be implemented
 - Based on EPIC's Manual Motor Processor
 - Contains detailed timing information
-