```
# This script has been edited to include 6 setting commands - SET - for the adult
zebrafish. It is advisable to run the script with a fish
# before starting the experiment to check that these set commands track this size
of fish consistently.

INCLUDE ZSYS                              # This includes background commands from
the system software. Always include this.


DEFINE CIRCLE 1                                      # These 2 DEFINE commands are
for setting stimuli types.
DEFINE SQUARE 2

DEFINE FEED_TIME 10                       # Defines this term (which is used below
in the script) as a certain amount of time in secs. Change the number to any amount
of time you need, in secs.
DEFINE LIGHT_TIME 20                      # Defines this term (which is used below
in the script) as a certain amount of time in secs. Change the number to any amount
of time you need, in secs.
DEFINE INTERTRIAL_TIME 10                 # Defines this term (which is used below
in the script) as a certain amount of time in secs. Change the number to any amount
of time you need, in secs.
DEFINE HABITUATION_TIME 4              # Defines this term (which is used below in
the script) as a certain amount of time in secs. Change the number to any amount of
time you need, in secs.
DEFINE TRIALS 100                       # Defines the number of times this term
in script will run.

DEFINE CHOICE_TIME 10

                                                                                #
The following 6 SET commands are for standard adult zebrafish (approx 2-3 cm long):
SET(AUTOREF_MODE,0)                                  # AUTOREF_MODE,0 enables
you to track one model organism (to track more than one organism use command -
SET(AUTOREF_MODE,1).
SET(AUTOREF_TIMEOUT,10)                              # This tells the unit how
many seconds to take an autoreference image in this case during a period of 10
seconds (you can adjust this number to less if
                                                                                #
the organism is likely to move soon after the experiment starts, or increase the
number if the organism is not likely to move much).
SET(DETECTOR_THRESHOLD,2)                            # This is the threshold in
pixels for detecting the organism, the lower the number the more sensitive the
detection.
SET(SEARCH_DISTANCE,50)                              # This should be set
according to the size of the organism in pixels , if the organism is round it
should be the size of the organism. For a fish shape
                                                                                #
this search distance can be smaller, eg half the size of the organism. It this
distance is too small you will see the crosshair will find the animal but
                                     # will jump around the animal.
SET(SEARCH_STEP,7)                                                  # The search step
is approximately the square root of the search distance.
SET(FILTER_RADIUS,20)                                # The filter radius  is the
approximate radius of the object in pixels.



ACTION MAIN                                    # This is the whole experiment's
outline/schedule. The actions listed here are always further explained below.

    SET(COUNTER1,COUNTER_ZERO)                                  # Sets COUNTER1 to
begin at zero. (In this experiment, COUNTER1 is the number of trials.)
    SET(COUNTER2,COUNTER_ZERO)                                  # Sets COUNTER2 to
begin at zero. (In this experiment, COUNTER2 is the number of initiated trials
while the initiator light is on.)
    SET(COUNTER3,COUNTER_ZERO)                                  # Sets COUNTER3 to
```

```
begin at zero. (In this experiment, COUNTER3 is the number of total correct choices
made.)
    SET(COUNTER4,COUNTER_ZERO)                  # Sets COUNTER4 to begin at zero.
(In this experiment, COUNTER4 is the number of correct choices on the left side.)
    SET(COUNTER5,COUNTER_ZERO)                  # Sets COUNTER5 to begin at zero.
(In this experiment, COUNTER5 is the number of correct choices on the right side.)
    SET(COUNTER6,COUNTER_ZERO)                  # Sets COUNTER6 to begin at zero.
(In this experiment, COUNTER6 is the number of total incorrect choices.)
    SET(COUNTER7,COUNTER_ZERO)                  # Sets COUNTER7 to begin at zero.
(In this experiment, COUNTER7 is the number of incorrect choices on the left side.)
    SET(COUNTER8,COUNTER_ZERO)                  # Sets COUNTER8 to begin at zero.
(In this experiment, COUNTER8 is the number of incorrect choices on the right
side.)
    SET(COUNTER9,COUNTER_ZERO)                  # Sets COUNTER9 to begin at zero.
(In this experiment, COUNTER9 is the number of feeder visits.)
    SET(COUNTER10,COUNTER_ZERO)                 # Sets COUNTER10 to begin at zero.
(In this experiment, COUNTER10 is the number of times the rewarded stimulus
displayed on the left side.)
    SET(COUNTER11,COUNTER_ZERO)                 # Sets COUNTER11 to begin at zero.
(In this experiment, COUNTER11 is the number of times the rewarded stimulus
displayed on the right side.)

    SETLIGHT(LIGHT2,SQUARE,1475,300,140)        # These SETLIGHT commands place the
stimuli into the correct location within the screen.
    SETLIGHT(LIGHT4,SQUARE,1475,700,140)
    SETLIGHT(LIGHT6,SQUARE,325,500,140)
    SETLIGHT(LIGHT7,SQUARE,150,500,140)
    SETLIGHT(LIGHT10,square,800,400,1600)

    LOAD(DETECTORS,"operant5hole.bmp")          # This command loads the bitmap
which indicates where the detectors are located on the screen. The bitmap should be
stored in the assets directory.
    LIGHTS(ALL,OFF)                             # This ensures the experiment
begins with no stimuli on.

    LOGCREATE("TEXT:")                          # Writes a line in the data output;
leaving a row blank.
    LOGRUN()

    LOGCREATE("RUNTIME|TEXT:|TEXT:|TEXT:TRIAL|TEXT:REWARDED_COLOUR")
# Writes a line in the data output labeling the cells.
    LOGAPPEND("TEXT:TIME_INI_ON|TEXT:INI_TRIGGERED|TEXT:TIME_INI_VISIT")
# Continues the line of data output.
    LOGAPPEND("TEXT:CHOICE
ACCURACY|TEXT:TIME_STIM_TRIGGERED|TEXT:FEEDER_TRIGGERED")
    LOGAPPEND("TEXT:TIME_FEEDER_VISIT|TEXT:REWARDED_SIDE|TEXT:LEFT_CORRECT")
    LOGAPPEND("TEXT:LEFT_INCORRECT|TEXT:RIGHT_CORRECT|TEXT:RIGHT_INCORRECT")
    LOGRUN()

        AUTOREFERENCE(0)                         # This creates an
autoreferenced image of the tank prior to invoking the trials. Needed for tracking.
        WAIT(HABITUATION_TIME)                  # System waits this amount of
time before starting another command. (Which is defined above).
        INVOKE(TWO_CHOICE_DISCRIMINATION,TRIALS)    # Starts the ACTION named and
repeats the command for the above predefined amount of times (term after the
comma). You can change the number of times these commands are invoked by changing
the number in the DEFINE command above.
        LIGHTS(ALL,OFF)                          # This turns all the lights off.

    LOGCREATE("TEXT:")                          # Writes a line in the data output;
leaving a row blank.
    LOGRUN()

        LOGCREATE("TEXT:|TEXT:|TEXT:--SUMMARY--|TEXT:TOTAL_TRIALS|TEXT:")
# Writes a line in the data output; labelling the cells.
    LOGAPPEND("TEXT:|TEXT:TOTAL_OF_INI_VISITS|TEXT:|TEXT:TOTAL_CORRECT")
# Continues the line of data output.
    LOGAPPEND("TEXT:|TEXT:TOTAL_FEEDER_VISITS|TEXT:|TEXT:TOTAL_STIM_ON_LEFT")
```

```
    LOGAPPEND("TEXT:TOTAL_LEFT_CORRECT|TEXT:TOTAL_LEFT
REWARDED|TOTAL_LEFT_INCORRECT")
    LOGAPPEND("TEXT:TOTAL_RIGHT_CORRECT|TEXT:TOTAL_RIGHT_INCORRECT")
    LOGRUN()

    LOGCREATE("TEXT:|TEXT:|TEXT:|COUNTER1|TEXT:|TEXT:|COUNTER2|TEXT:|COUNTER3")
# Writes a line in the data output; labelling the cells and placing the COUNTERS in
the correct cells.
    LOGAPPEND("TEXT:|COUNTER9|TEXT:|COUNTER10|COUNTER4|COUNTER7|COUNTER5|COUNTER8")
# Continues the line of data output.
        LOGRUN()

    LOGCREATE("TEXT:|TEXT:|TEXT:|TEXT:|TEXT:|TEXT:|TEXT:|TEXT:")
# Writes a line in the data output; labelling the cells.
    LOGAPPEND("TEXT:TOTAL_INCORRECT|TEXT:|TEXT:|TEXT:|TEXT:TOTAL_STIM_ON_RIGHT")
# Continues the line of data output.
    LOGRUN()

    LOGCREATE("TEXT:|TEXT:|TEXT:|TEXT:|TEXT:|TEXT:|TEXT:|TEXT:"
# Writes a line in the data output; labelling the cells and placing the COUNTERS in
the correct cells.
    LOGAPPEND("COUNTER6|TEXT:|TEXT:|TEXT:|COUNTER11")
# Continues the line of data output.
    LOGRUN()

COMPLETE                                # Signals the system that this ACTION is
complete.


ACTION TWO_CHOICE_DISCRIMINATION        # Defines this ACTION below which is used
in ACTION MAIN.

    SET(COUNTER1,COUNTER_INC)           # COUNTER1 will now count incrementally
each time this command occurs. (In this experiment, COUNTER1 is the number of
trials.)
    LIGHTS(LIGHT6,WHITE)                # Designates this light as the colour
following the comma and turns it on. You can change the colour by just changing the
colour name in these types of commands.

    LOGFIELD(1," ")                     # Writes information on the data output.
The first parameter is a field number (the cell number on the data sheet), the
second parameter is text to write in that field (within the ""). (In this
experiment, cell 1 in the row will be blank.)
    LOGFIELD(2,COUNTER1)                # Writes information on the data output.
The first parameter is a field number (the cell number on the data sheet), the
second parameter is text to write in that field (within the ""). (In this
experiment, cell 2 in the row will be COUNTER1.)
        LOGFIELD(4,RUNTIME)                 # Writes information on the data
output. The first parameter is a field number (the cell number on the data sheet),
the second parameter is text to write in that field (within the ""). (In this
experiment, cell 4 in the row will the time the initiator light comes on.)

        DETECTOR(DETECTOR6,CHOOSE_LOCATION) # If this detector is triggered, the
ACTION following the comma is invoked (which is defined below).
        WAIT(LIGHT_TIME)                    # System waits this amount of time
before starting another command. (Which is defined above).
    LIGHTS(LIGHT6,OFF)                  # This turns LIGHT6 off, position is
defined above. (In this experiment, this is the initiator light.)
        WAIT(INTERTRIAL_TIME)               # System waits this amount of time
before starting another command. (Which is defined above).
        LOGFIELD(COMMIT)                    # Command to write the LOGFIELDS to
your data file.

COMPLETE                                # Signals the system that this ACTION named
is complete.


ACTION CHOOSE_LOCATION                                  # Defines this ACTION below
```

```
which is used in ACTION MAIN. (In this experiment, this section of the script
randomly selects the position of the stimulus colours.)

        LIGHTS(LIGHT6,OFF)                  # This turns LIGHT6 off, position is
defined above. (In this experiment, this is the initiator light.)
        SELECT(RED_LEFT,RED_RIGHT)              # This command selects the first
ACTION 50% of the time, and the second ACTION (following the comma) 50% of the
time. These ACTIONs are defined below.

COMPLETE                                # Signals the system that this ACTION named
is complete.


ACTION RED_LEFT                                         # Defines this ACTION below
which is used in ACTION MAIN.

        LIGHTS(ALL,OFF)                     # This turns all the lights off.
        LOGFIELD(6,RUNTIME)                                     # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 6 in the row will be the time the
initiator was triggered.)
        LOGFIELD(5,"TRIGGERED")                         # Writes information on the
data output. The first parameter is a field number (the cell number on the data
sheet), the second parameter is text to write in that field (within the ""). (In
this experiment, cell 5 in the row will log whether the initiator light was
triggered.)
        SET(COUNTER2,COUNTER_INC)                       # COUNTER2 will now count
incrementally each time this command occurs. (In this experiment, COUNTER2 is
number of initiations.)
        LOGFIELD(3,"RED")                                       # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 3 in the row will be the rewarded
colour.)
        LOGFIELD(11,"LEFT")                                     # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 11 in the row will side the rewarded
colour is displayed.)
    SET(COUNTER10,COUNTER_INC)          # COUNTER10 will now count incrementally
each time this command occurs. (In this experiment, COUNTER10 is the number of
times the rewarded colour is on the left side.)
        LIGHTS(LIGHT2,RED)                # Designates this light as the colour
following the comma and turns it on. You can change the colour by just changing the
colour name in these types of commands.
    LIGHTS(LIGHT4,YELLOW)               # Designates this light as the colour
following the comma and turns it on. You can change the colour by just changing the
colour name in these types of commands.
        DETECTOR(DETECTOR2,RED_LEFT_CORRECT)                    # If the designated
detector is triggered, the ACTION following the comma is invoked (which is defined
below).
    DETECTOR(DETECTOR4,YELLOW_RIGHT_INCORRECT)          # If the designated
detector is triggered, the ACTION following the comma is invoked (which is defined
below).
        WAIT(CHOICE_TIME)                   # System waits this amount of time
before starting the next command. (Which is defined above).
        LIGHTS(ALL,OFF)                     # This turns all the lights off.

COMPLETE                                # Signals the system that this ACTION named
is complete.


ACTION RED_RIGHT                                        # Defines this
ACTION below which is used in ACTION MAIN.

        LIGHTS(ALL,OFF)                     # This turns all the lights off.
    LOGFIELD(6,RUNTIME)                             # Writes information on the
```

```
data output. The first parameter is a field number (the cell number on the data
sheet), the second parameter is text to write in that field (within the ""). (In
this experiment, cell 6 in the row will be the time the initiator was triggered.)
        LOGFIELD(5,"TRIGGERED")                                 # Writes information on the
data output. The first parameter is a field number (the cell number on the data
sheet), the second parameter is text to write in that field (within the ""). (In
this experiment, cell 5 in the row will log whether the initiator light was
triggered.)
        SET(COUNTER2,COUNTER_INC)                               # COUNTER2 will now count
incrementally each time this command occurs. (In this experiment, COUNTER2 is
number of initiations.)
        LOGFIELD(3,"RED")                                               # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 3 in the row will be the rewarded
colour.)
        LOGFIELD(11,"RIGHT")                                    # Writes information on the
data output. The first parameter is a field number (the cell number on the data
sheet), the second parameter is text to write in that field (within the ""). (In
this experiment, cell 11 in the row will side the rewarded colour is displayed.)
    SET(COUNTER11,COUNTER_INC)          # COUNTER11 will now count incrementally
each time this command occurs. (In this experiment, COUNTER11 is the number Of
times the rewarded colour is on the right side.)
        LIGHTS(LIGHT2,YELLOW)                # Designates this light as the colour
following the comma and turns it on. You can change the colour by just changing the
colour name in these types of commands.
    LIGHTS(LIGHT4,RED)                  # Designates this light as the colour
following the comma and turns it on. You can change the colour by just changing the
colour name in these types of commands.
        DETECTOR(DETECTOR2,YELLOW_LEFT_INCORRECT)               # If the designated
detector is triggered, the ACTION following the comma is invoked (which is defined
below).
    DETECTOR(DETECTOR4,RED_RIGHT_CORRECT)                       # If the designated
detector is triggered, the ACTION following the comma is invoked (which is defined
below).
        WAIT(CHOICE_TIME)                       # System waits this amount of time
before starting another command. (Which is defined above).
        LIGHTS(ALL,OFF)                     # This turns all the lights off.

COMPLETE                                # Signals the system that this ACTION named
is complete.


ACTION RED_LEFT_CORRECT                 # Defines this ACTION below which is used in
ACTION MAIN.

    LIGHTS(ALL,OFF)                         # This turns all the lights off.
        LOGFIELD(8,RUNTIME)                                             # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 8 in the row will the time the stimulus
light was triggered.)
        LOGFIELD(7,"CORRECT")                                   # Writes information on the
data output. The first parameter is a field number (the cell number on the data
sheet), the second parameter is text to write in that field (within the ""). (In
this experiment, cell 7 in the row will log the choice accuracy.)
        LOGFIELD(12,"1")                                                # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 12 in the row log a '1' indicating a
leftsided correct choice.)ect
        SET(COUNTER3,COUNTER_INC)                               # COUNTER3 will now count
incrementally each time this command occurs. (In this experiment, COUNTER3 is the
total number of correct choices made.)
        SET(COUNTER4,COUNTER_INC)                               # COUNTER4 will now count
incrementally each time this command occurs. (In this experiment, COUNTER4 is the
total number of left correct choices.)
    LIGHTS(LIGHT7,WHITE)                # Designates this light as the colour
```

```
following the comma and turns it on. You can change the colour by just changing the
colour name in these types of commands.
        FEEDER(1)                           # Command to start the feeder
mechanism.
        DETECTOR(DETECTOR7,ATFEEDER)            # If the designated detector is
triggered, the ACTION following the comma is invoked (which is defined below).
        WAIT(FEED_TIME)                             # System waits this amount of
time before starting another command. (Which is defined above).
        LIGHTS(ALL,OFF)                     # This turns all the lights off.

COMPLETE                                # Signals the system that this ACTION named
is complete.


ACTION RED_RIGHT_CORRECT                # Defines this ACTION below which is used in
ACTION MAIN.

    LIGHTS(ALL,OFF)                         # This turns all the lights off.
        LOGFIELD(8,RUNTIME)                                         # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 8 in the row will the time the stimulus
light was triggered.)
        LOGFIELD(7,"CORRECT")                           # Writes information on the
data output. The first parameter is a field number (the cell number on the data
sheet), the second parameter is text to write in that field (within the ""). (In
this experiment, cell 7 in the row will log the choice accuracy.)
        LOGFIELD(14,"1")                                        # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 14 in the row log a '1' indicating a
rightsided correct choice.)
        SET(COUNTER3,COUNTER_INC)                       # COUNTER3 will now count
incrementally each time this command occurs. (In this experiment, COUNTER3 is the
total number of correct choices made.)
        SET(COUNTER5,COUNTER_INC)                       # COUNTER2 will now count
incrementally each time this command occurs. (In this experiment, COUNTER5 is
number of correct choices on the right side.)
    LIGHTS(LIGHT7,WHITE)                # Designates this light as the colour
following the comma and turns it on. You can change the colour by just changing the
colour name in these types of commands.
        FEEDER(1)                           # Command to start the feeder
mechanism.
        DETECTOR(DETECTOR7,ATFEEDER)            # If the designated detector is
triggered, the ACTION following the comma is invoked (which is defined below).
        WAIT(FEED_TIME)                             # System waits this amount of
time before starting another command. (Which is defined above).
        LIGHTS(ALL,OFF)                     # This turns all the lights off.

COMPLETE                                # Signals the system that this ACTION named
is complete.


ACTION YELLOW_LEFT_INCORRECT             # Defines this ACTION below which is used
in ACTION MAIN.

        LIGHTS(ALL,OFF)                     # This turns all the lights off.
    LIGHTS(LIGHT10,white)
        LOGFIELD(8,RUNTIME)                                         # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 8 in the row will the time the stimulus
light was triggered.)
        LOGFIELD(7,"INCORRECT")                         # Writes information on the
data output. The first parameter is a field number (the cell number on the data
sheet), the second parameter is text to write in that field (within the ""). (In
this experiment, cell 7 in the row will log the choice accuracy.)
        LOGFIELD(13,"1")                                        # Writes
```

```
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 13 in the row log a '1' indicating a
leftsided incorrect choice.
        SET(COUNTER6,COUNTER_INC)                       # COUNTER6 will now count
incrementally each time this command occurs. (In this experiment, COUNTER6 is the
total number of incorrect choices made.)
        SET(COUNTER7,COUNTER_INC)                       # COUNTER7 will now count
incrementally each time this command occurs. (In this experiment, COUNTER7 is
number of incorrect choices made on the left side.)
        WAIT(FEED_TIME)                                 # System waits this
amount of time before starting another command. (Which is defined
above).

COMPLETE                            # Signals the system that this ACTION named
is complete.


ACTION YELLOW_RIGHT_INCORRECT        # Defines this ACTION below which is used
in ACTION MAIN.

        LIGHTS(ALL,OFF)                 # This turns all the lights off.
    LIGHTS(LIGHT10,white)
        LOGFIELD(8,RUNTIME)                             # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 8 in the row will the time the stimulus
light was triggered.)
        LOGFIELD(7,"INCORRECT")                         # Writes information on the
data output. The first parameter is a field number (the cell number on the data
sheet), the second parameter is text to write in that field (within the ""). (In
this experiment, cell 7 in the row will log the choice accuracy.)
        LOGFIELD(15,"1")                                # Writes
information on the data output. The first parameter is a field number (the cell
number on the data sheet), the second parameter is text to write in that field
(within the ""). (In this experiment, cell 15 in the row log a '1' indicating a
rightsided incorrect choice.
        SET(COUNTER6,COUNTER_INC)                       # COUNTER6 will now count
incrementally each time this command occurs. (In this experiment, COUNTER6 is the
total number of incorrect choices.)
        SET(COUNTER8,COUNTER_INC)                       # COUNTER8 will now count
incrementally each time this command occurs. (In this experiment, COUNTER8 is
number of incorrect choices on the right side.)
        WAIT(FEED_TIME)                                 # System waits this
amount of time before starting another command. (Which is defined
above).

COMPLETE                            # Signals the system that this ACTION named
is complete.


ACTION ATFEEDER

    LOGFIELD(10,RUNTIME)                                # Writes information on the
data output. The first parameter is a field number (the cell number on the data
sheet), the second parameter is text to write in that field (within the ""). (In
this experiment, cell 10 in the row will be the time the feeder light comes on.)
        LOGFIELD(9,"TRIGGERED")                         # Writes information on the
data output. The first parameter is a field number (the cell number on the data
sheet), the second parameter is text to write in that field (within the ""). (In
this experiment, cell 9 in the row will whether the feeder light is visited.)
        SET(COUNTER9,COUNTER_INC)                       # COUNTER9 will now count
incrementally each time this command occurs. (In this experiment, COUNTER9 is the
number of visits to the feeder
    WAIT(FEED_TIME)                                     # System waits this
amount of time before starting another command. (Which is defined above).
        LIGHTS(ALL,OFF)                         # This turns all the lights
off.
```

```
COMPLETE                                # Signals the system that this ACTION named
is complete.
```