Alomvars input file notes

Developed by Paul Mathewson 1/20/2014

Input Line 1.

* Vertebrate/invertebrate: Enter the 6 letter animal group name. This input does not affect anything in the user allometry subroutine, but make sure it matches the group listed in the Endo.dat input file.
* Locomotion type: Enter the type of locomotion the animal uses (bidpedal or quadrupedal). This in affects the amount of leg surface area in contact with the ground when the animal is active. Bipedal animals do not have the end areas of forelimbs in contact with the ground.
  + Note: do not confuse bipedal/quadrupedal here with the number of appendages in the Endo.dat input file. A appendage animal can be bipedal (e.g., a human).

Input Lines 2-7: Body part dimensions.

* Dia vertical (distal)/dia sideways: Enter the vertical diameter (or side-to-side diameter for legs) of the body part in centimeters. For a cone shape, this input line is the larger diameter end (e.g., the base of a conical head).
* Dia horizont/dia front-back: Enter the horizontal diameter (or the front-to-back-diameter for legs) of the body part in centimeters. For a cone shape, this input is the smaller diameter (e.g., the snout of a conical head).
* Length: Enter the length of the body part in centimeters.
  + Diameters and lengths include fur, if the animals are furred.
* Fur depth –midorsl/ventrl: This is where you enter the dorsal and ventral fur depths for each body part in millimeters.
  + Ventral and dorsal fur depth inputs each have spaces for two inputs. The reason for this is to allow users to investigate the impact of different fur depths. The user-supplied allometry subroutine calculates skin dimensions by subtracting the fur depth from the total dimensions.
    - Thus, simply changing fur depth without changing total dimensions as well would result in different skin dimensions, interfering with a direct comparison of the impact of fur depth.
    - To get around this, there are two inputs for each fur depth. The first input should be the “reference” fur depth (i.e., the fur depth in the photo or specimen the body dimensions were taken from). All skin diameters will be based on this fur depth.
    - The second fur depth input is the fur depth the user wants to model. In many cases this will be the same as the reference fur depth if the user has no interest in investigating different fur depths.
    - However, say the user wants to see the difference between 20mm fur and 10mm fur, and the reference animal on which measurements are taken has 20 mm fur. For the first run of the model, the fur inputs would be 20//20. For the second run of the model (to see the impact of shorter fur) the fur inputs would be 20//10.
  + If the user wants to model only one side of a body part as having fur or feathers (and the other side being bare), the user must enter a fur depth less than 0.1mm BUT NOT ENTER 0.0. Entering 0.0 will cause problems. The model knows that fur depth less than 0.1mm means bare skin.
    - Note: be sure to also enter fur diameters and densities, etc., in the endo.dat input file for the side that is supposed to be bare. Entering zeroes will result in problems.
* Density: Enter the density of the body part (kg/m3). This input is used to apportion total animal mass to different body parts.
* Geometry: Enter the approximate geometric shape of the body part.
* 6th Appendage tail or proboscis (input for 6th appendage line only): If modeling a 6th body part, users must choose whether the extra appendage is a tail (T) or a proboscis (P). This affects surface area calculations since the end are will be subtracted from the torso surface area if it is a tail or from the head if it is a proboscis.
* NOTE: To not include any given body part in the modeling, simply enter 0.0 for *all* inputs for that body part. This will tell the program to skip this body part.

Input Line 8.

* Absolute measurement: The absolute measurement input scales all body inputs up to real animal size using this input.
* Shoulder hyt; torso diam, etc.: This input line tells the program what the absolute measurement refers to.
  + Shoulder height: the absolute measurement refers to the animal’s actual front leg length + actual torso vertical diameter.
  + Torso diameter: the absolute measurement refers to the animal’s actual torso vertical diameter
  + Total length1: the absolute measurement refers to the animal’s actual head length + neck length + torso length.
  + Total length2: the absolute measurement refers to the animal’s actual head length + neck length + torso length + tail length.
  + Bipedal: the absolute measurement refers to the animal’s actual head length + neck length+ torso length + rear leg length.
* Adjust initial dimensions input: this input allows users to change the body part dimensions or the absolute dimension value in order to have body part volume and mass match the user-specified density. Towards the end of the user-supplied allometry subroutine the program takes the calculated volume and mass (based on the user-supplied inputs) to calculate a density. This calculated density is then compared to the density the user supplied in the alomvars.dat input file.
  + If the calculated density is different than the user-supplied density and the user has chosen 0.0 for the adjust dimensions input, there is no change to the body part dimensions, and the calculated density is used as the density of the body part.
  + If the calculated density is different than the user-supplied density and the user has chosen 1.0 for the adjust dimensions input, a subroutine calculates how much the radial dimensions (i.e., the diameters; lengths are unaffected) of the body parts need to be adjusted (larger or smaller) in order for the calculated density to match the user supplied density.
  + If the calculated density is different than the user-supplied density and the user has chosen 2.0 for the adjust dimensions input, the program changes the absolute measurement until the calculated density matches the user-supplied density. Thus, this option changes ALL dimensions (diameters and lengths).
  + NOTE: it is always a good idea to check the OUTPUT.out file generated after you run the program to see what the final calculated body part dimensions are to make sure they are reasonable. If they are unreasonable, you will need to adjust the appropriate inputs in the this input file.

Input Line 9.

* Subcutaneous Fat on Body Parts: This input allows users to choose which body parts have subcutaneous fat. Choose ‘Y’ or ‘N’ for each body part. The total fat mass is apportioned to each of the body parts the user specifies based on the relative masses of the different body parts
* Where does time-dependent mass change come from? This input allows users to choose where any temporal changes in total body mass (entered in the Endo.dat input file) come from. The user can choose for all changes in body mass to come from the torso (by entering 1.0) or from all body parts in proportion to each part’s mass (by entering 0.0).

Input Line 10.

* Post1-4: These inputs allow users to choose what inactive postures their animal can assume by selecting Y or N or each of 4 inactivity postures.
  + Posture 1: all body parts are still modeled for inactive animals, but all parts are modeled as being in contact with the substrate instead of just the leg ends.
  + Posture 2: the legs are lumped into the torso but head, neck and tail are modeled separately. The head and neck are modeled as being held off the ground.
  + Posture 3: the legs are lumped into the torso but head, neck and tail are modeled separately and are considered to be in contact with the ground.
  + Posture 4: the whole animal is modeled as a single shape
* Start Sleep Posture: The user tells the program which inactivity posture the animal first assumes when sleeping. If the animal is cold, a thermoregulatory option is to curl up if inactive, which increases the inactivity posture number to the extent allowed by the user.
* Start Shade Posture: The user tells the program which
  + Thus, an animal that sleeps curled up but rests in the shade with its head up would use “4” as the starting sleeping position but “2” as the starting resting position.
* End inactive posture: The user specifies the extent to which they want their animal to be able to curl up when inactive. For example, if you do not want your animal to curl up completely into a single lump shape, choose 3 or less as your end inactive posture.
  + Note: be sure that your Y/N and starting/ending positions are consistent. For example, if you say start/end positions are 1 and 4, respectively, but do not select Y for any one of those positions in the Post1-4 inputs, that position will be skipped in the animal modeling.

Input Line 10.

* MinFlshK head-tail: These inputs allow users to specify different minimum flesh thermal conductivities for different body parts.
  + This is pertinent for larger animals with large torsos. A large body part with a lower thermal conductivity (e.g., 0.4 W/mK) results in unrealistically low skin temperatures. The program automatically checks to make sure the skin temperature does not drop below 3°C, but this provides the user with additional control.
  + Note: make sure the minimum values listed here do not contradict the maximum/minimum flesh thermal conductivities entered in the Endo.dat input file (e.g., do not set the minimum thermal conductivity in alomvars.dat to be greater than the maximum or less than the minimum specified in endo.dat input file).
* Variable Core Temp? This allows the user to choose whether to model the heat loss from bare legs or from a bare 6th appendage using Warren’s variable temperature solution. This solution assumes that the temperature along the body part is variable (e.g., the leg skin temperature varies from torso temperature to ground temperature) rather than being uniform temperature along its length. From this gradient a heat loss amount is calculated.
  + 6 Apndg on Ground (Y/N): This tells the program what boundary condition to use for the 6th appendage when using the variable temperature solution. If the appendage is in contact with the ground (‘Y’), the ground temperature will be used as the boundary temperature (e.g. a tail that is in contact with the ground). If the appendage is not in contact with the ground (‘N’), the air temperature at animal height will be used for the boundary temperature (e.g. a tail that is held straight out, above the ground).
  + Note: only use this for bare skinned legs/tails. The variable solution currently does not include any fur.
* Bird sleep standing up? Choosing ‘Y’ models sleeping birds as a single lump shape consisting of head, neck and torso on top of legs. Choosing ‘N’ models birds according to the inactivity postures described above.
* Bird sleep on 1 or 2 legs?: The user chooses whether the bird is sleeping standing on 1 leg (in which case the mass of the second leg is incorporated into the torso lump) or on two legs.
  + Note: these two inputs only kick in when the animal is specified as being a bird. Users modeling any other kind of animal can use any input here.