Supplementary Materials

1.- Main algorithms

1.1.- Creating the modified model associated with a metabolic task.

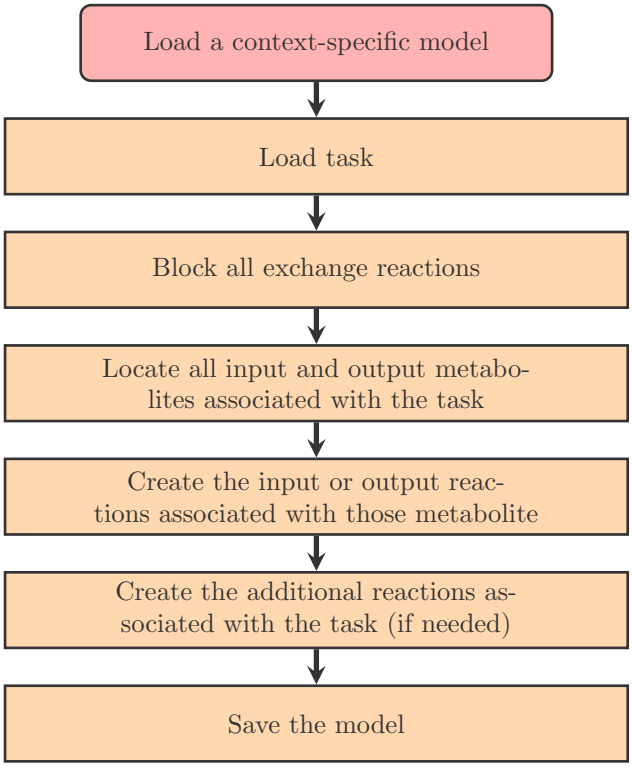

Figure 1: Procedure for creating a modified model associated with a metabolic task.

1.2.- Check if a given set of genes G is a gCS for the model associated with the Biomass production.

Observe that this method only checks if a given set of genes is a genetic cut set for biomass production. To ensure that it is also a gMCS we must also check that no proper subset is also a gCS.

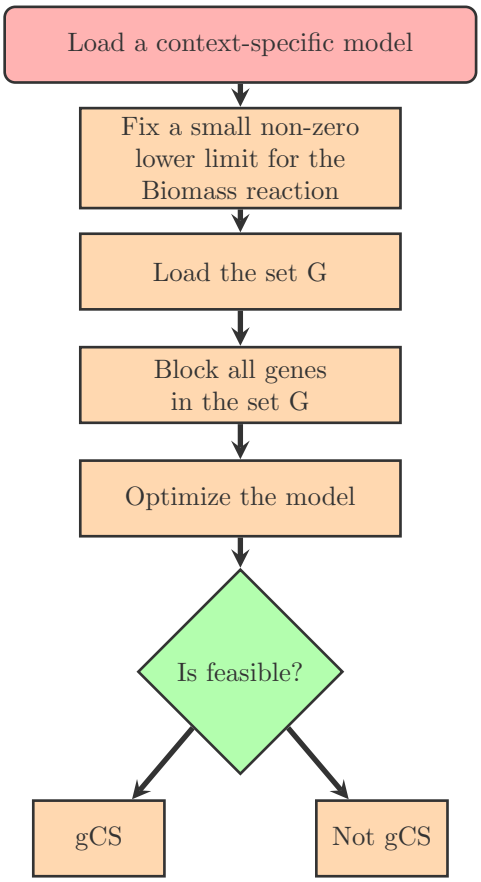

Figure 2: Procedure to check if a given set of genes G is a gCS for the model associated with the Biomass production.

1.3.- Check if a given set of genes G is a gCS for the model associated with a metabolic task.

Observe that this method only checks if a given set of genes is a genetic cut set for biomass production. To ensure that it is also a gMCS we must also check that no proper subset is also a gCS.

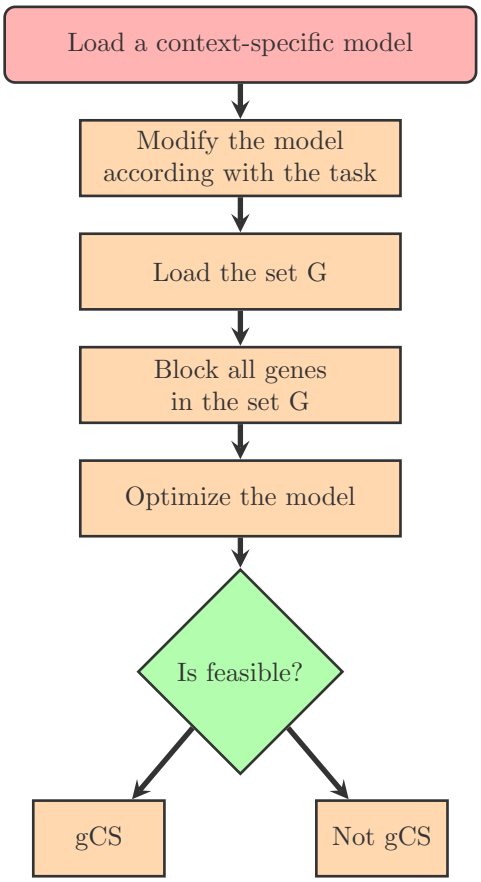

Figure 3: Calculation of gMCSs that are specific to the model and can only be computed using Metabolic Tasks.

1.4.- Calculate all gMCSs that are specific to the model and can only be computed using Metabolic Tasks

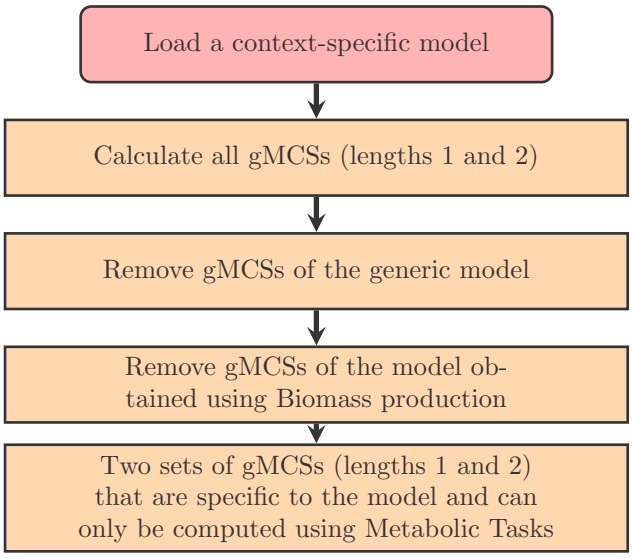

Figure 4: Procedure of the calculation of gMCSs that are specific to the model and can only be computed using Metabolic Tasks.

2.- List of essential metabolic tasks.

Order	Description
MT-1	Aerobic rephosphorylation of ATP from glucose
MT-2	Aerobic rephosphorylation of GTP
MT-3	Aerobic rephosphorylation of CTP
MT-4	Aerobic rephosphorylation of UTP
MT-5	ATP de novo synthesis
MT-6	CTP de novo synthesis
MT-7	GTP de novo synthesis
MT-8	UTP de novo synthesis
MT-9	dATP de novo synthesis
MT-10	dCTP de novo synthesis
MT-11	dGTP de novo synthesis
MT-12	dTTP de novo synthesis
MT-13	Histidine uptake
MT-14	Isoleucine uptake
MT-15	Leucine uptake
MT-16	Lysine uptake
MT-17	Methionine Uptake
MT-18	Phenylalanine Uptake
MT-19	Threonine uptake
MT-20	Tryptophan uptake
MT-21	Valine uptake
MT-22	Glycerate 3-phosphate de novo synthesis
MT-23	Mitochondrial acetyl-CoA de novo synthesis
MT-24	Mitochondrial AKG de novo synthesis
MT-25	Erythrose 4-phosphate de novo synthesis
MT-26	Fructose 6-phosphate de novo synthesis
MT-27	Glyceraldehyde 3-phosphate de novo synthesis
MT-28	Glucose 6-phosphate de novo synthesis
MT-29	Mitochondrial oxaloacetate de novo synthesis
MT-30	Phosphoenolpyruvate de novo synthesis
MT-31	Pyruvate de novo synthesis
MT-32	Ribose 5-phosphate de novo synthesis
MT-33	Mitochondrial succinyl-CoA de novo synthesis
MT-34	Cholesterol de novo synthesis
MT-35	Protein synthesis from AAs
MT-36	Oxidative phosphorylation
MT-37	Oxidative decarboxylation
MT-38	Krebs cycle NADH
MT-39	Ubiquinol-to-proton
MT-40	Ubiquinol-to-ATP
MT-41	Beta oxidation of saturated FA
MT-42	Beta oxidation of long-chain FA
MT-43	Beta oxidation of odd-chain FA
MT-44	Beta oxidation of unsaturated fatty acid (n-9)
MT-45	Beta oxidation of unsaturated fatty acid (n-6)
MT-46	Beta oxidation of all NEFAs
MT-47	Choline uptake
MT-48	Inositol uptake
MT-49	Phosphatidylcholine de novo synthesis
MT-50	Phosphatidylethanolamine de novo synthesis
MT-51	Phosphatidylserine de novo synthesis
MT-52	Phosphatidylinositol de novo synthesis
MT-53	Thiamin phosphorylation to TPP
MT-54	Coenzyme A synthesis from pantothenate
MT-55	FAD synthesis from riboflavin
MT-56	Heme biosynthesis
MT-57	Biomass in Ham's medium

Table 1: Metabolic tasks and their order.