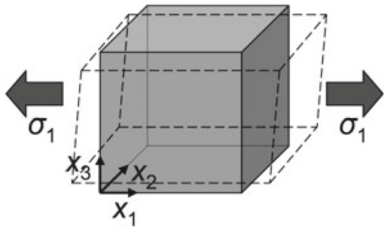

Fig. 2.1 Anisotropic stretched cube

not restricted to the only Poisson's effect, due to the terms $S_{ij},\ i, j = 1, 2, 3,\ i \neq j$: in the anisotropic case, there is also a coupling between normal stress and shear strain, due to terms $S_{kl},\ k = 4, 5, 6,\ l = 1, 2, 3$. In addition, generally speaking $S_{12} \neq S_{23} \neq S_{31}$, so that the Poisson's effect is different in the orthogonal directions, i.e. $\varepsilon_2 \neq \varepsilon_3$. In the same way, usually $S_{4k} \neq S_{5k} \neq S_{6k},\ k = 1, 2, 3$, so that also for the shearing stresses it is $\varepsilon_4 \neq \varepsilon_5 \neq \varepsilon_6$. Finally, the anisotropic cube does not only change its volume under the unique action of a traction, like in isotropic bodies, but it changes also its form: it becomes a prism with no orthogonal faces.

Let us now consider the same cube submitted to a unique shear stress, say σ_5; Eq. (2.21) gives then $\varepsilon_k = S_{k5}\sigma_5 \quad \forall k = 1, \ldots, 6$ (or, equivalently, $\varepsilon_{ij} = Z_{ij31}\sigma_{31} \quad \forall i, j = 1, 2, 3$). This time, we can observe a coupling between shear stresses and extension strains, due to the terms $S_{lk},\ k = 4, 5, 6,\ l = 1, 2, 3$ and also a coupling between a shear stress and the shearing strains in orthogonal planes, due to the terms $S_{ij},\ i, j = 4, 5, 6,\ i \neq j$. This last effect is called the *Chentsov's effect*: it is completely analogous to the Poisson's effect, but it concerns shear stresses and strains in the place of tractions and extensions. Also in this case, the couplings shear stress-extensions and the Chentsov's effect are not necessarily the same in all the planes, because generally speaking $S_{l4} \neq S_{l5} \neq S_{l6},\ l = 1, 2, 3$ and $S_{45} \neq S_{56} \neq S_{64}$. It is then apparent that, submitted to simple shear stress, the cube changes not only its shape, but also its volume, unlike in the case of isotropic bodies.

Finally, the compliance matrix can be subdivided into parts in charge of a particular effect, like in Fig. 2.2. It is immediately recognized that a similar partition is possible also for the stiffness matrix $[C]$.

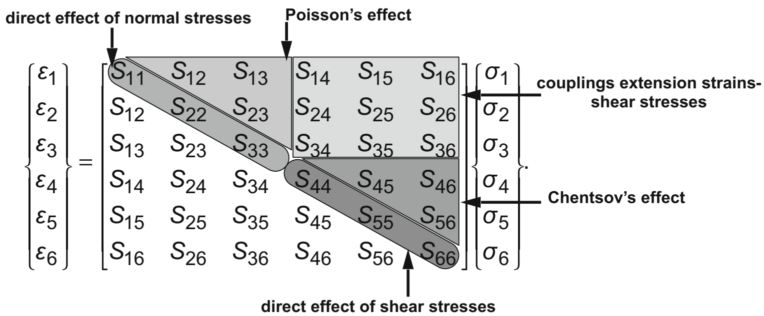

Fig. 2.2 Partition of the compliance matrix by mechanical effects