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Chapter 1 : Theories Used in Social Work Practice & Practice Models

*Advances in Anisotropy: Selected Theory, Modeling, and Case Studies: Proceedings of the Seventh International Workshop on Seismic Anisotropy (7Iwsa) [Julie A. Hood] on calendrierdelascience.com *FREE* shipping on qualifying offers.*

 Abstract Soft tissues in general exhibit anisotropic mechanical behavior, which varies in three dimensions based on the location of the tissue in the body. In the past, there have been few attempts to numerically model tissue anisotropy using composite-based formulations involving fibers embedded within a matrix material. However, so far, tissue anisotropy has not been modeled experimentally. In the current work, novel elastomer-based soft composite materials were developed in the form of experimental test coupons, to model the macroscopic anisotropy in tissue mechanical properties. A soft elastomer matrix was fabricated, and fibers made of a stiffer elastomer material were embedded within the matrix material to generate the test coupons. The coupons were tested on a mechanical testing machine, and the resulting stress-versus-stretch responses were studied. The fiber volume fraction FVF , fiber spacing, and orientations were varied to estimate the changes in the mechanical responses. This work lays the foundation for the experimental modelling of tissue anisotropy, which combined with microscopic studies on tissues can lead to refinements in the simulation of localized fiber distribution and orientations, and enable the development of biofidelic anisotropic tissue phantom materials for various tissue engineering and testing applications. Introduction Soft tissues in the human body, namely, the skin, skeletal muscles, connective tissues, and tissues forming the organs such as the brain and myocardial tissues , are not homogeneous or isotropic [1 , 2]. These tissues exhibit regional and directional anisotropy in three-dimensional space [3]. This material anisotropy could be mainly attributed to the variations in the distribution of collagen fibers in tissues [2]. In the past, collagen fiber distribution in human cadavers and animal models was studied using histological investigations [4 , 5]. Advancements in imaging techniques in recent years have allowed looking at fiber distributions in the human body using the diffusion tensor magnetic resonance imaging DT-MRI technique [6]. However, recreating such fiber-tissue model in a computational framework is challenging due to four reasons. First, the fibers are in the form of lines or splines in a DT-MRI model, which needs to be converted to volumes before they could be integrated with a tissue matrix volume. Second, a huge percentage of fibers overlap with each other making it very difficult to generate clean fiber meshes which could be used in analyses. Third, the exact number of fibers in a region is difficult to estimate, unless a histological study is conducted for that region to calculate the fiber volume fraction FVF. Fourth, most tissues continuously merge with other tissues with no discernible boundaries e. In the literature, there have been few attempts to incorporate tissue anisotropy in finite element FE models [1 , 3 , 7 â€” 12]. The most common method has been to discretize a tissue or an organ into regions with a discernible fiber orientation and approximate a principal fiber direction in those regions. A stiffer material property is assigned in the principal fiber direction compared to the other directions [1 , 8], which can also be loaded using various passive excitation methods [10]. Another method has been to model a tissue region using transversely isotropic material formulation [13 , 14]. Tissue anisotropy was incorporated successfully computationally in various recent FE models. The LA muscle was decomposed into multiple sections, and the principal fiber directions in each of these sections were identified. To induce anisotropy, the relative stiffness between the fiber and the matrix components was varied while maintaining the same overall stress-versus-strain response along the fiber direction. Two pelvic floor models were developed with different anisotropy ratios for the LA muscle, and a fetal skull model was made to pass through the vaginal canal and pelvic floor muscles including the LA. The analyses revealed that by increasing the fiber anisotropy, the mechanical response recorded for a LA muscle is significantly affected along with a decrease in the magnitude of force required for delivery. No validation techniques were, however, adopted due to the lack of experimental data. Researchers working on traumatic brain injury TBI have recently used tissue anisotropy material modeling techniques to advance the biofidelity and precision of the numerical computations [11]. Mainly from a tissue anisotropy perspective, the white matter of the brain was being looked at due to the coherent orientation of fibers [15]. Finite element simulations were conducted to study the influence of fiber orientations on the activation sequence of the various sections of the LV, and the changes at each of the segments were tracked dynamically. The two layers of fibers going in different directions in the heart were simulated, and their effect on the pumping efficiency of the heart was investigated. Experimentally, anisotropy has been measured in skin [12 , 18], pelvic [19 â€" 21], and brain tissues [22]; however, to date, there exists no tissue simulant or phantom material which incorporates tissue anisotropy. A way to physically model anisotropic tissue materials would allow the validation of the results from the computational models. Also, such a model would be indispensable to generate realistic tissue phantoms with anisotropic effects, for various biomechanical testing and tissue engineering applications. In the current work, soft composite-like materials made of elastomers were used to macroscopically simulate tissue anisotropy at the scale of tensile-testing coupons. The anisotropic mechanical behavior of the skin, pelvic, and brain tissues were compared with the properties of the soft composites. Also, the effect of varying FVF, fiber spacing, and orientation were investigated. Additionally, the nonlinear stress-versus-stretch responses of the tissue simulants were characterized using hyperelastic constitutive relationships. The following sections discuss the various methodologies for fabrication of the novel soft composites, key results, and conclusions. Materials and Methods 2. A two-part extremely soft elastomer material with a shore hardness of 10 was used for developing the matrix material. Part A and part B were mixed at a 1: Each coupon was clamped on a universal tensile testing machine MTS Criterion 42 and tested at a constant strain rate of 0. Several considerations were taken while testing the soft materials [24]. First, soft materials slip very easily, thereby special grips coated with a rubber-like material which provides high friction against slipping were used. Second, strain rate has been observed to significantly affect the load response of soft materials [25], and thus a specific strain rate was used, so that results can be precisely compared with literature. The stress-versus-strain plots generated from the tests were checked for repeatability Figure 2 shows the average plots for the four sets of samples tested and also compared with the literature [26 â€" 29] to ensure no machine calibration errors. Stress-versus-stretch plots for four batches of samples 5 in each with a 1: A two-part hard elastomer material with a shore hardness of 30A was selected to make the hard fibers Figure 1 b. The combined stresses-versus-stretch results for the 30 specimens are presented in Figure 3. The following section discusses the fabrication of the composite material using the soft matrix material and the hard fiber material. Stress-versus-stretch plots of 30 coupons with a 1: Soft Tissue Composite Fabrication Fibers made of the hard elastomer material and of different widths and thicknesses were laid in a rectangular box, and the soft elastomer material was poured into it. Test specimens were cut out with the following dimensions: The fiber volume fraction FVF for each of the test specimens was calculated based on 1. The lowest and highest FVFs were estimated to be 0. Figure 4 a shows the range of specimens created with different FVFs for further testing. The effect of variations of the fiber spacing and number on soft composite mechanical properties were investigated. The overall dimensions of the specimens with one, two, and three fibers were 35 mm 10 mm.

Chapter 2 : Advances in Anisotropy : Julie A. Hood :

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Aims of such simulations are typically the prediction of the material shape, failure, and mechanical properties during deformation. Further goals lie in the computer assisted lay-out of manufacturing tools used for intricate processing steps. Any such simulation requires that the material under investigation is speci- fied in terms of its respective constitutive behavior. Modern finite element simulations typically use three sets of material input data, covering hardening, forming limits, and anisotropy. The current article is about the latter aspect. It reviews different empirical and physically based concepts for the integration of the elastic-plastic anisotropy into metal forming finite element simulations. Particular pronunciation is placed on the discussion of the crystallographic anisotropy of polycrystalline material rather than on aspects associated with topological or morphological microstructure anisotropy. The reviewed anisotropy concepts are empirical yield surface approximations, yield surface formulations based on crystallographic homogenization theory, combinations of finite element and homogenization approaches, the crystal plasticity finite element method, and the recently introduced texture component crystal plasticity finite element method. The paper presents the basic physical approaches behind the different methods and discusses engineering aspects such as scalability, flexibility, and texture update in the course of a forming simulation. Introduction objectives of such simulations are the prediction of the mate- rial shape after forming, in particular the thickness distribu- The advance of modern well-tailored and optimized tion; the minimization of material failure in conjunction with materials nowadays provides a huge and steadily-growing the optimization of material flow during forming; and the cal- application spectrum to customers of formed products. Further related essential applications are in the fields of optimizing tool designs, predicting pressing forces, and simulating the final surface appearance of the part. The latter aspect involves both, macroscopic e. Rendering continuum-type metal forming simulations scientifically sound, predictive at the microstructure scale, in good accord with experiment, and at the same time eco- nomically rewarding requires that the involved materials are properly specified in terms of their respective constitutive behav- ior. For this purpose modern finite element simulations typically employ three sets of Fig. Modern finite element approaches which aim at simulating realistic metal forming operations typically material input data, covering hardening, require three sets of material input data, namely, the strain hardening curve, a forming limit diagram, and information about the crystallographic and morphological anisotropy. The article focuses on concepts for inte- forming limits, and anisotropy Fig. The grating elastic-plastic anisotropy. It reviews both, empirical and physically based concepts for the integration of the elastic-plastic anisotropy crystal plasticity approaches are the long calculation times into metal forming finite element simulations. An improvement in speed of the anisotropy of polycrystalline material rather than on aspects crystal plasticity methods is attained by the recent introduc- associated with topological or morphological microstructure tion of the texture component crystal plasticity finite element anisotropy. First, we give a brief in- homogenization theory, combinations of finite element and troduction to the physical origin of elastic-plastic crystallo- homogenization approaches, the crystal plasticity finite ele- graphic anisotropy. Second, we present the basic approaches ment method, and the recently introduced texture component behind the different anisotropy concepts and discuss aspects crystal plasticity finite element method. From Scalar to Tensorial Materials Engineering user to include more of the physics associated with crystalline anisotropy. The present state in anisotropy engineering is The yield surface represents the generalization of the yield naturally different between industrial applications and basic point from uniaxial tensile testing to general stress states. The use of empirical or semi-empirical polynomials Expanding the yield point into a closed yield surface is only for yield surface approximations is the standard procedure in required if the material under inspection shows elastic-plastic the industrial practice whereas the various crystal plasticity anisotropy, i.

However, such behavior is the rule and not the excep- basic materials sciences. The importance of empirical ap- tion in real materials. Polycrystals with random and thus qua- proaches in the industrial practice is due to the fact that they si-isotropic behavior do practically not occur in sheet metal provide short computation times, allow for simple mechani- forming operations. Strong crystalline anisotropy is typically cal input data, and are flexible with respect to additional fit encountered in many engineering materials such as alloys points obtained by texture information. An important weak- based on iron, aluminum, copper, magnesium and titanium. The prevalence of the crystal plasticity finite element is the crystalline arrangement of the atoms. Metallic matter method in basic research is due to its physical basis and the usually occurs in polycrystalline form where each grain has a incorporation of texture changes. The distribution of the orientations in a polycrystalline second derivative of the electronic potential. The aniso- constants can be written in the form of a fourth-rank elastic tropy of the elastic tensor and the discrete nature of crystallo- stiffness tensor Cijkl or in the form of a fourth-rank elastic graphic slip along densely packed lattice directions on pre- compliance tensor Sijkl According to ferred crystal planes also entails a highly anisotropic integral 1 response of such polycrystalline specimens during mechani- cal loading. While the elastic-plastic deformation of a single Symmetry relations and thermodynamic considerations crystal and bicrystals as a function of their orientation can reduce the 81 elastic constants to a set of 3 independent num- nowadays be well predicted, plasticity of polycrystalline mat- bers C, C, C Corresponding to C11, C12, C44 in ter is less well understood. This is essentially due to the intri- reduced matrix notation in the case of cubic crystal symmetry cate elastic-plastic interactions occurring during co-deforma- e. This C, C, C, C, C Corresponding to C11, C12, interaction leads to strong heterogeneity in terms of strain, C13, C33, C44 in reduced matrix notation in the case of hexag- stress, and crystal orientation. Another difficulty in tackling onal crystal symmetry e. The deviation from the anisotropy of polycrystalline matter lies in the fact that elastic isotropy can for cubic crystals be quantified by the so the crystals rotate during forming, owing to the skew sym- called Zener anisotropy ratio metric portion of the displacement gradients created by crys- tal slip. This means that texture and anisotropy gradually 2 change during forming, even under constant strain path con- ditions. This means that - even in the case of very simple strain paths - mechanics and texture should wherever 3. Plastic Anisotropy possible be integrated into the simulation concept due to the The plastic anisotropy of crystalline matter also departs strong non-linearity of the problem. Artificial separation of from the directionality of the electronic bond and the result- the two aspects continuum mechanics, crystal plasticity ing crystal lattice structure. Both aspects determine which slip mechanics may entail severe misinterpretations, particularly planes and which translation vectors Burgers vectors serve in the case of strain path changes. The main conse- ture and anisotropy and their evolution during forming un- quence of this anisotropy in the present context is that metals derline that for an engineering purpose one major aim of are deformed in a discrete rather than in a continuum fashion polycrystal research must lie in identifying adequate mea- rendering plasticity an intrinsically anisotropic property of sures for mapping crystallographic anisotropy into classical metals. Assuming that the normalized Burgers vectors bj and mathematical methods for predicting large strain plastic the normalized slip plane normals ni of the s different slip deformation. The second even more challenging aim lies in systems available in a particular crystal lattice are known, developing methods for predicting also the change of crystal their orientation factors mij can be readily formulated as dya- anisotropy during forming on a sound physical basis. Elastic Anisotropy 4 The elastic anisotropy of crystalline matter departs from when given in crystal coordinates. One must note that all slip the directionality of the electronic bond and the resulting vectors used in the equations are normalized. Transforming crystal lattice structure. For small deviations of the atoms the latter equation into the sample coordinate system Fig. The plastic anisotropy of crystalline matter departs from the directionality of the electronic bond and the resulting crystal lattice structure. Both aspects determine the slip planes and translation vectors Burgers vectors on which lattice dislocations move during plastic deformation. The diagram shows the different coordinate system and the resulting geometrical transformation operations one has to consider in this context. Using these s different orientation factors mklsym,s of the s different available slip systems for the transformation of an external load into the slip geometry provides a simple kine- matic formulation for the yield surface of a single crystal. One must note that the Einstein summation rule applies in all equations in case not stated otherwise. Most points on the single crystal yield surface describe sin- gle-slip conditions. In the graphical representation of the yield surface single-slip generally takes place when the stress Fig. A simple Schmid-type formulation considering the different orientation factors of all available slip systems which essentially transforms an external load into shear tensor in vector transformation notation, using the tensor- stresses acting on the slip systems provides a kinematic formulation for the yield sur- vector transformation rule see Equation 8 face of a single crystal. The figure indicates that body centered cubic alloys therefore be- have plastically principally different from face centered cubic alloys. Note that the cubes placed in Figure 4 indicate the changing orien- are then denoted as Taylor positions. It must be noted in this tation of the external reference system, i. Its magnitude for a given strain rate determines the kine- nates of the stress state Fig. The conus positions for the matic size of the yield surface in the corresponding stress stress can be calculated using a conventional homogenization direction characterizing the correct polyslip hyperconus and approach, for instance Taylor-Bishop-Hill theory indicated thus the kinematic portion of the corresponding stress state. The number at the end of each row gives the number of different conus cases and single slip cases for the respective Taylor state. The total Taylor stress state for a poly- crystalline aggregate can for a given external strain rate state then be integrated as a volume weighted sum of all Taylor tensors derived separately for each grain for this boundary condition Fig. Empirical Approximations of the Yield Surface The first empirical mathematical description of an aniso- tropic plastic yield surface was suggested in by von Mises in the form of a quadratic function. Most points on the single crystal yield surface describe single-slip conditions. In the graphical representation of the yield surface single-slip generally takes place when which was originally designed to empirically approximate the stress state here given in vector notation points at a hyperplane rather than a the plastic anisotropy of single crystals was in rendered hyperconus. The strain rate tensor is indicated by D and m is the Schmid factor, i. The small cubes placed in the figure indicate the by Hill[2] into a generalized form using the Huber-Mises- changing relative orientation between the external reference system and the crystal Hencky approach Fig. Polycrystal deformation requires polyslip conditions in order to satisfy strain rate compatibility among the grains. Polyslip states are crystallographically charac- terized by hyperconus coordinates of the stress state. The conus positions for the stress can be calculated using a conventional homogenization approach, for instance Taylor-Bishop-Hill theory indicated by dTBH. For cubic crystals the yield surface reveals 4 classes of Taylor states for polyslip and one for single slip. These yield states are referred to as 5 i penta slip state 5 active slip systems: M pq fcc, bcc r edu ced: The Taylor stress state for a polycrystalline aggregate can for a given external t r i slip 3 a ct ive slip syst em s: In this figure M is the bi slip 2 a ct ive slip syst em s: The counter k sums over all sin gle slip 1 a ct ive slip syst em: Although empirical constitu- REVIEWS tive laws can be used to gradually change the yield surface shape during forming, their capability is typically constrained by a lack of physical information about the actual develop- ment of the crystallographic texture during forming. Crystallographic Approximations of Elastic- Plastic Anisotropy 5. Schematical presentation of an empirical a and of a texture-based b yield sur- face approach. It must be noted though that the actual incorporation of a crystallo- A typical problem in the field of anisotropy engineering graphic yield surface also requires a functional form. Although Lankfort values taken in different directions of a specimen. While the Lankfort coefficients and the ing on the influence of the crystallographic texture. The yield stress can be determined from tensile testing, the direct macroscopic elastic properties of a textured polycrystal can measurement of mechanical response under complex loads is be calculated by formulating appropriate volume-weighted an intricate task. Although Hill-based anisotropy simulations means of the individual elastic single crystal tensor, rotated referring to the Hill model provide decent approxima- parallel to the respective local coordinate system of each in- tions at least of the initial plastic anisotropy in case of certain dividual crystal. This average value of the integral elastic iron textures and a number of textures in interstitial free tensor must therefore take into account all individual orien- steels, they typically fail to predict the yield shape of high tations of the grains which are described by the orientation strength steels, austenitic steels, most aluminum alloys, cop- distribution function. Typical examples where the Hill An early homogenization approach for the elastic re- yield criterion is not applicable are cup drawing opera- sponse under an external load was suggested by Voigt, who tions of aluminum or copper crystals with six-fold slip sym- assumed that in the case of a macroscopically prescribed metry, i. In this rate state as the entire sample, irrespective of its spatial case six slip systems have identical Schmid factor relative to position in the specimen. The strain rate would then be the surface which cannot be modeled by the Hill polynomial homogeneous throughout the sample. However, in a poly- owing to its quadratic form. Since in the Voigt model the prescribed strain rate is der polynomial forms have been proposed in the last dec- the same everywhere in the sample, the stress must vary. In the last years various the elastic stiffness as a function of orientation with the ori- authors have presented improved empirical yield surface ap- entation distribution function. A different approach to treat- proaches where the yield function can be fitted using both ing the homogenization problem in an elastically loaded mechanically obtained and even texture-based data. He sug- The chief advantage of using an empirical anisotropic gested that in the case of a macroscopically prescribed stress yield surface function as a constitutive law in metal forming state each material portion is in the same stress state irre- finite element simulations is time efficiency and the simple spective of its spatial position in the specimen. The stress mechanical methods with which it can be derived. The domi- would then be homogeneous throughout the specimen. The nant disadvantage of empirical yield surface functions is that elastic response may then vary from grain to grain, in the anisotropy of polycrystalline matter generally changes accord with the local orientation of the crystal.

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Chapter 3 : OSA | Modeling and experimental study of photoinduced anisotropy in hybrid solgel films

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A theory may explain human behavior, for example, by describing how humans interact or how humans react to certain stimuli. Social work practice models describe how social workers can implement theories. Practice models provide social workers with a blueprint of how to help others based on the underlying social work theory. While a theory explains why something happens, a practice model shows how to use a theory to create change. Social Work Theories There are many social work theories that guide social work practice. Here are some of the major theories that are generally accepted in the field of social work: It is premised on the idea that an effective system is based on individual needs, rewards, expectations, and attributes of the people living in the system. According to this theory, families, couples, and organization members are directly involved in resolving a problem even if it is an individual issue. New behavior will continue if it is reinforced. According to this theory, rather than simply hearing a new concept and applying it, the learning process is made more efficient if the new behavior is modeled as well. Erikson believed everyone must pass through eight stages of development over the life cycle: Each stage is divided into age ranges from infancy to older adults. This social work theory describes the personality as consisting of the id responsible for following basic instincts , the superego attempts to follow rules and behave morally , and the ego mediates between the id and the ego. In healthy individuals, these stages contribute to creativity, wisdom, and altruism. In people lacking healthy ego development, experiences can lead to psychosis. Social Work Practice Models There are many different practice models that influence the way social workers choose to help people meet their goals. Here are some of the major social work practice models used in various roles, such as case managers and therapists: Rather than tell clients what to do, social workers teach clients how to apply a problem solving method so they can develop their own solutions. Social workers and clients collaborate together and create specific strategies and steps to begin reaching those goals. In the story, the client is not defined by the problem, and the problem exists as a separate entity. Social workers assist clients in identifying patterns of irrational and self-destructive thoughts and behaviors that influence emotions. The model includes seven stages: This social work practice model is commonly used with clients who are expressing suicidal ideation.

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Chapter 5 : Tissue Anisotropy Modeling Using Soft Composite Materials

Carcione, J. M., and Helbig, K., , Wave polarization in transversely-isotropic and orthorhombic media: in Hood, J., Ed., Advances in Anisotropy, Selected Theory.