Wave Propagation In Structures Abaqus Example

physics of acoustic wave propagation the theory of acoustic wave propagation is now described this is an important theory in its own right because explorationists often assume that wave propagation in rocks can be approximated by acoustic theory so that they can simplify their data processing algorithms, hi i am working on modeling wave propagation in abaqus cae i am not expert on abaqus and trying to figure out how it works i have a 2d shell steel plate 1 centimeter by 1 centimeter and try to obtain wave speed at any points of plate i put the material properties in and used abaqus explicit analysis, stress wave propagation between different materials masters thesis in the masters programme structural engineering and building technology tim svensson filip tell department of civil and environmental engineering and department of applied mechanics division of structural engineering and division of material and computational mechanics, and flexural waves described in the framework of the elementary theory there are many textbooks on the theory of wave propagation in elastic solids and structures and they differ rather substantially in quality and style therefore this chapter of lecture notes is written in a self contained way, ultrasonic wave propagation simulation hi i am new to abaqus i am trying to explore the wave propagation of a ultrasonic wave in aluminum plate and would like to look at a 3d simulation of the, this paper presents an efficient approach to simulate lamb wave propagations in thin plate structures by using new time domain spectral plate elements a novel approach is proposed to incorporate the coupling of piezoelectric transducers within the two dimensional plate element the diagonal mass matrix is obtained by using a simple method with less computational effort, rather limited in explaining a wide range of wave propagation phenomena such as early time transient response and near eld wave patterns this is because wave elds in layered structures are formed by the interaction of pressure p and shear s waves with mode conversions occurring at the interfaces between layers the e ects of these, wave interacts with a heterogeneity it can be transmitted reflected converted into other kinds of waves and into sound or heat with loss of mechanical energy three general classes of models have been proposed to describe the propagation of stress waves in rock masses an excellent in depth review of these classes can be found in cai 2001, figure 1 blast wave propagation blast loading and blast effects on structures an overview t ngo p mendis a gupta amp j ramsay the university of melbourne australia abstract the use of vehicle bombs to attack city centers has been a feature of campaigns by terrorist or ganizations around the world, in this example you will create a model of a stress wave propagation in a bar related topics abaqus basics the bar has the dimensions shown in figure 1 figure 1 schematic for wave propagation in a bar to make the problem a one dimensional strain problem all four lateral faces are on rollers thus the three dimensional model simulates a, in the paper by ham et al 2014 the method of finite spheres enriched for transient wave propagation problems was used and a monotonic convergence of the calculated solutions with decreasing time step size was seen this is an important property for practical analyses and different from what is seen in traditional finite element solutions, modeling and simulation of interactions between blast waves and structures for blast wave mitigation modeling and simulation of interactions between blast aw ves and structures for blast aw ve mitigation wen peng ph d stress wave propagation within the structure are neglected the basic concept of fsi is, a python script for this example is provided in stress wave propagation in a bar section a 7 instructions on how to fetch the script and run it within abaqus cae are given in appendix a example files a plug in script for this example is available in the abaqus cae plug in toolset, bramwellhill pulse wave velocity the resulting nite pulse wave velocity is solely the result of the fsi 4 conclusion we established a stable fsi coupling between fluent and abaqus software using a reduced order model approach which results in a correct wave propagation simulation with a nite pulse wave velocity very close to, hi i am working on modeling wave propagation in abaqus cae i am not expert on abaqus and trying to figure out how it works i have a 2d shell steel plate 1 centimeter by 1 centimeter and try to obtain wave speed at any points of plate, ii national institute of technology rourkela orissa 769008 india certificate this is to certify that the thesis entitle stress wave propagation in split hopkinson pressure bar being submitted by smaranika nath 710ce2013 in the partial fulfilment of the requirement for the award for the degree of master of technology in civil, abaqus standard is more efficient for solving smooth
nonlinear problems on the other hand abaqus explicit is the clear choice for a wave propagation analysis there are however certain static or quasi static problems that can be simulated well with either either program typtyp cally ically these are problems that usually would, doyle et al systematically studied the application of sem to wave propagation in structures which include not only rods and beams but also vary cross section waveguide 27 layered solids 28, abaqus a problem about the output variables s and u 2d lamb wave propagation in a thin plate spectral finite element method for modeling lamb wave propagation in plate like structures, as shown in fig 1 a a soil structure dynamic interaction model is composed of actual upper structure surface foundation and finite soil zone with the artificial boundary under the rectangular coordinate system x y z the model is applied to the analysis of s wave propagation through the semi infinite soil medium to the actual, in built up composite structures can be challenging this study focuses on simulating the use of lamb waves for detecting damage in built up composite structures lamb wave propagation and detection are simulated using a commercially available transient dynamic analysis software abaqus explicit finite element fe analysis codes 16, for the wave propagation this work is divided into two parts the first part describes the theoretical background of elastic waves propagation in isotropic materials the second part introduces numerical simulations of elastic waves propagating in structures containing cracks, therefore its value can be prescribed using a boundary condition in a manner consistent with other boundary conditions in abaqus for example you may set the acoustic pressure at all of the nodes at a duct inlet to a prescribed amplitude to analyze the propagation of waves along the duct, blast wave propagation in the air and action on rigid obstacles supervisors engineers take into account the resistance of the structure to natural phenomena for example resistance to dynamic loads caused by earthquake if there is a risk of occurrence of it surrounding structures on incident wave propagation will be examined thesis, hi i am working on modeling wave propagation in abaqus cae i am not expert on abaqus and trying to figure out how it works i have a 2d shell steel plate 1 centimeter by 1 centimeter and try to obtain wave speed at any points of plate i put the material properties in and used abaqus explicit analysis, lamb wave propagation simulation in smart composite structures dulip samaratunga and ratneshwar jha department of mechanical and aeronautical engineering clarkson university potsdam ny 13699 abstract abaqus standard simulation of lamb waves in smart composite plates is investigated for detecting delamination type damage, using lsses pesea can accurately and efficiently model ultrasonic wave propagation as well as sensor signals in layered media for example laminated composite structures pesea is a powerful tool to directly study the scattered waves and the sensitivity of sensor signals to damage in plate like structures, wave propagation and instabilities in monolithic and periodically structured elastomeric materials undergoing large deformations k bertoldi1 2 and m c boyce1 1department of mechanical engineering massachusetts institute of technology cambridge massachusetts 02139 4307 usa 2multi scale mechanics msm ts ctw universiteit twente p o box 217 7500 ae enschede netherlands, if you do not have access to abaqus cae or another preprocessor the input file that defines this problem can be created manually as discussed in example stress wave propagation in a bar section 3 4 of getting started with abaqus explicit keywords version, to demonstrate the ability of the identified wave modes to detect flaw abaqus cae a finite element analysis fea software package was used as a tool to provide a better understanding of the behaviour of guided waves in the rail structure the fea tool was used to examine the possibilities for generating and propagating guided waves in rails, finite element modeling of impact generated stress wave propagation in concrete plates for non destructive evaluation by tripti pradhan a thesis presented to the graduate and research committee of lehigh university in candidacy for the degree of master of science in civil and environmental engineering lehigh university november 2014, instability induced pattern transformation in soft metamaterial with hexagonal networks for tunable wave propagation in abaqus v6 13 band structure of acoustic waves in phononic lattices, wave propagation and instabilities in monolithic and periodically structured elastomeric materials undergoing large deformations k bertoldi1 2 and m c boyce1 1department of mechanical engineering massachusetts institute of technology cambridge massachusetts 02139 4307 usa 2multi scale mechanics msm ts ctw universiteit twente p o box 217 7500 ae enschede netherlands, if you do not have access to abaqus cae or another preprocessor the input file that defines this problem can be created manually as discussed in example stress wave propagation in a bar section 3 4 of getting started with abaqus explicit keywords version, how to generate wave in abaqus crack
detection using lamb waves in abaqus cae part 1 duration 13 55 navnath raut 9 351 views, impact will excite waves propagating in the structure which gives rise to lamb modes lamb modes are structural oscillations of the wall and it is the frequency of these modes that are used to determine the thickness of the wall the elastic properties of the structure can in turn be obtained by measuring the velocities of the waves propagation, abaqus a problem about the output variables s and u 2d lamb wave propagation in a thin plate spectral finite element method for modeling lamb wave propagation in plate like structures, doyle et al systematically studied the application of sem to wave propagation in structures which include not only rods and beams but also vary cross section waveguide 27 layered solids 28, 2006 abaqus users conference 359 absorbing boundary conditions for seismic analysis in abaqus andreas h nielsen jacobs babtie 95 bothwell st glasgow uk abstract absorbing boundary conditions are required to simulate seismic wave propagation in elastic media in the first part of the paper a number of relevant abcs are reviewed with, the last part of the thesis studies guided wave propagation in pipes with bends the dispersion curves for toroidal structures are derived using a finite element modal solution and the main characteristics of the modes of a curved pipe are decribed a series of pipes with dierent bend radii were investigated experimentally, a wavelet spectral finite element wsfe based user defined element uel is formulated and implemented in abaqus commercial finite element software for wave propagation analysis in one dimensional composite structures the wsfe method is based on the first order shear deformation theory to yield accurate and computationally efficient results for high frequency wave motion, various types of sources of input can cause wave propagation in a structure some of these are wave propagation due to crack growth wave propagation due to the excitation by an actuator to study and compare baseline and damaged signals wave propagation due to a foreign object impact like a bird hit or a torpedo hit etc, therefore its value can be prescribed using a boundary condition in a manner consistent with other boundary conditions in abaqus for example you may set the acoustic pressure at all of the nodes at a duct inlet to a prescribed amplitude to analyze the propagation of waves along the duct, fe simulation of wave propagation in honeycomb composite structures fe simulation of wave propagation in honeycomb composite structures sebastiano84 mechanical op 3 nov 15 17 38 hey everybody i am very new to abaqus and finite elements i modeled a cfrp facesheet as well an aluminum honeycomb core both with continuum shell elements and, therefore its value can be prescribed using a boundary condition in a manner consistent with other boundary conditions in abaqus for example you may set the acoustic pressure at all of the nodes at a duct inlet to a prescribed amplitude to analyze the propagation of waves along the duct, in order to import the loads from the cfd analysis into abaqus the co simulation tool mpcci was used the steady state cfd solution provides both the pressure on the structural surface as well as the fluid velocity around the structure in general acoustic wave propagation in a flowing medium differs from that in a stationary medium, the same wave propagation analysis performed on different materials would take different amounts of computer time depending on the wave speed of the material for example if we were to change the material from steel to aluminum the wave speed would change from 5 15 10 3 m s to, impact will excite waves propagating in the structure which gives rise to lamb modes lamb modes are structural oscillations of the wall and it is the frequency of these modes that are used to determine the thickness of the wall the elastic properties of the structure can in turn be obtained by measuring the velocities of the waves propagation, some of the available techniques for lamb wave propagation simulation are the finite element method fem the boundary element method and the finite difference method the fem is the best method when complex damage geometry or boundary is involved, duced as a exible and accurate method to simulate the wave propagation in unbounded structures 17 however it is men tioned that this approach can be computational expensive 18 many additional unknowns insert in the standard pml formulaions because the required wave equations stated in their standard, time harmonic elastic wave propagation in an infinite circular cylinder composed of perfectly bonded laminae with possibly distinct mechanical properties as shown in figure 21 is considered here a cylindrical coordinate system is adopted as defined in section 1 18 1 1 and shown in figure 21 the displacement components will be taken as u r u and u z or u v w, lamb wave propagation simulation in smart composite structures dulip samaratunga and ratneshwar jha department of mechanical and aeronautical engineering clarkson university potsdam ny 13699 abstract abaqus standard simulation of lamb waves in smart composite plates is investigated for detecting delamination type damage, the uel is
formulated and implemented in abaqus for wave propagation analysis in composite structures with complexities frequency domain formulation of wsfe leads to complex valued parameters which are decoupled into real and imaginary parts and presented to abaqus as real values, guidelines for using the finite element method for modeling guided lamb wave propagation in shm processes m gresil v giurgiutiu y shen and b poddar abstract the aim of the work presented in this paper is to provide guidelines for extending the modeling capacities and improve quality and reliability of 2 d guided wave, modelling of wave propagation in composite structures is much more structures in numerical examples are modelled and meshed using abaqus cae and wsfe formulation based elements are assigned as element type using uel the numerical examples include five different cases namely healthy plate plate, how to generate wave in abaqus crack detection using lamb waves in abaqus cae part 1 duration 13 55 navnath raut 9 351 views, and flexural waves described in the framework of the elementary theory there are many textbooks on the theory of wave propagation in elastic solids and structures and they differ rather substantially in quality and style therefore this chapter of lecture notes is written in a self contained way, cst022 the 19th conference of mechanical engineering network of thailand 19 21 october 2005 phuket thailand simulations of stress wave propagation from dynamic loads tarin vanichayangkurantont kunntinee maneeratana and nuwong chollacoop department of mechanical engineering chulalongkorn university bangkok national metal and materials technology center mtec pathumthani email tarinv yahoo, a python script for this example is provided in stress wave propagation in a bar section a 7 instructions on how to fetch the script and run it within abaqus cae are given in appendix a example files a plug in script for this example is available in the abaqus cae plug in toolset, standing waves when the excitation frequency lies in the pass band or in the stop bands predicted by the floquet theory for an unbounded structure 3 1 boundary integral equation method and floquet theory travelling wave analysis a periodic structure consisting of curved and straight pipe segments shown in figure 9 is considered, method for modeling guided lamb wave propagation in shm waves in free plates is a classic example abaqus explicit uses an explicit integration based the university of western australia civil , physics of acoustic wave propagation the theory of acoustic wave propagation is now described this is an important theory in its own right because explorationists often assume that wave propagation in rocks can be approximated by acoustic theory so that they can simplify their data processing algorithms, longitudinal wave propagation comparison abaqus model has 5700 plane stress elements cps4r wsfe response matches very well with abaqus fe computation times wsfe 4s abaqus explicit 82s with 8 parallel processors f t 1 m 0 5m 0 5m 0 01 m x y z tip long wave response long wave response at mark single lap joint layup 0 10, abaqus standard is more efficient for solving smooth nonlinear problems on the other hand abaqus explicit is the clear choice for a wave propagation analysis there are however certain static or quasi static problems that can be simulated well with either either program tytyp cally these are problems that usually would, to demonstrate the ability of the identified wave modes to detect flaw abaqus cae a finite element analysis fea software package was used as a tool to provide a better understanding of the behaviour of guided waves in the rail structure the fea tool was used to examine the possibilities for generating and propagating guided waves in rails, longitudinal wave propagation comparison abaqus model has 5700 plane stress elements cps4r wsfe response matches very well with abaqus fe computation times wsfe 4s abaqus explicit 82s with 8 parallel processors f t 1 m 0 5m 0 5m 0 01 m x y z tip long wave response long wave response at mark single lap joint layup 0 10, the propagation of guided waves in a complex structure is a complicated process that is difficult to understand and interpret in order to exploit the ae wave it is necessary to understand its nature and propagation characteristics the finite element method fem has been commonly used to illustrate the guided, in built up composite structures can be challenging this study focuses on simulating the use of lamb waves for detecting damage in built up composite structures lamb wave propagation and detection are simulated using a commercially available transient dynamic analysis software abaqus explicit finite element fe analysis codes 16, the phase changes of the propagating wave when moving from one cell to the other this result expressed in eq 4 is known as blochs theorem commonly wave propagation properties of periodic structures are charac terized by computing a relation between the periodicity of waves in space and time namely the dispersion relation, abaqus standard the standard solver employs technologies ideal for static and low speed dynamic events where highly accurate stress solutions are critically important examples
include sealing pressure in a gasket joint steady state rolling of a tire or crack propagation in a composite airplane fuselage, guidelines for using the finite element method for modeling guided lamb wave propagation in shm processes m gresil v giurgiu tiu y shen and b poddar abstract the aim of the work presented in this paper is to provide guidelines for extending the modeling capacities and improve quality and reliability of 2 d guided wave, using lsses pesa can accurately and efficiently model ultrasonic wave propagation as well as sensor signals in layered media for example laminated composite structures pesa is a powerful tool to directly study the scattered waves and the sensitivity of sensor signals to damage in plate like structures, the same wave propagation analysis performed on different materials would take different amounts of computer time depending on the wave speed of the material for example if we were to change the material from steel to aluminum the wave speed would change from 5 15 10 3 m s to, trussed structure numerical method is used to obtain and monitor the behaviour of the guided waves in plate having trussed structures in this study the plate is simulated using finite element method in abaqus and the resulting displacements are used to plot the dispersion curves using 2d fast fourier transform 5 once the dispersion, in this example you will create a model of a stress wave propagation in a bar related topics abaqus basics the bar has the dimensions shown in figure 1 figure 1 schematic for wave propagation in a bar to make the problem a one dimensional strain problem all four lateral faces are on rollers thus the three dimensional model simulates a, acoustic emission ae is defined as the transient elastic wave generation due to a rapid release of strain energy within or on the surface of a material which is well known as a highly sensitive technique to detect various types of damage such as crack propagation in structure in order to obtain the propagation characterizations of ae signals simulation based on finite element method fem, analysis of elastic stress wave propagation 167 figure 2 a prototype transmitter and b cad model of redesigned transmitter see online version for colours a b with a functioning prototype built and the electronics tested the next question that, pulse wave imaging pwi is an ultrasound based method for non invasive characterization of arterial stiffness based on pulse wave propagation reliable numerical models of pulse wave propagation in normal and pathological aortas could serve as powerful tools for local pulse wave analysis and a guideline for pwi measurements in vivo, pulse wave imaging pwi is an ultrasound based method for non invasive characterization of arterial stiffness based on pulse wave propagation reliable numerical models of pulse wave propagation in normal and pathological aortas could serve as powerful tools for local pulse wave analysis and a guideline for pwi measurements in vivo, absorbing boundary conditions for seismic analysis in abaqus andreas h nielsen jacobs bothwell st glasgow uk abstract absorbing boundary conditions are required to simulate seismic wave propagation in elastic media, hi i am working on modeling wave propagation in abaqus cae i am not expert on abaqus and trying to figure out how it works i have a 2d shell steel plate 1 centimeter by 1 centimeter and try to obtain wave speed at any points of plate, fea analysys abaqus stress wave propagation in a bar nonlinear explicit dynamics abaqus framed reinforced concrete multi storey structure under earthquake crack detection using lamb, trussed structure numerical method is used to obtain and monitor the behaviour of the guided waves in plate having trussed structures in this study the plate is simulated using finite element method in abaqus and the resulting displacements are used to plot the dispersion curves using 2d fast fourier transform 5 once the dispersion, dynamic stress analysis of the effect of an air blast wave on a stainless steel plate by figure 1 0 blast wave propagation figure 2 0 pressure time curve for a free air blast wave for example the radius in which debris from the explosion not from the blast wave are, analyses performed using acoustic elements an acoustic medium and a dynamic procedure can simulate a variety of engineering phenomena including low amplitude wave phenomena involving fluids such as air and water and shock analysis involving higher amplitude waves in fluids interacting with structures, fea analysys abaqus stress wave propagation in a bar nonlinear explicit dynamics abaqus framed reinforced concrete multi storey structure under earthquake crack detection using lamb, shear modulus and velocity of propagation are state dependent and do not have to be known in advance as with other constitutive relations nonlinear effects during transient wave propagation from an originally homogeneous soil column for free field conditions including liquefaction in a quasi one dimensional problem, in the paper by ham et al 2014 the method of finite spheres enriched for transient wave propagation problems was used and a monotonic convergence of the calculated solutions with decreasing time step size was seen this is an important property for practical
analyses and different from what is seen in traditional finite element solutions, wave interacts with a heterogeneity it can be transmitted reflected converted into other kinds of waves and into sound or heat with loss of mechanical energy three general classes of models have been proposed to describe the propagation of stress waves in rock masses an excellent in depth review of these classes can be found in cai 2001, the models of shock wave propagation in an if ws containing nanocomposite have been performed using a statistical volume element sve implemented within the abaqus explicit finite element system the sve as shown in fig 1 has randomly distributed particles in a matrix with the structure having no particular direc tionality the if ws, time harmonic elastic wave propagation in an infinite circular cylinder composed of perfectly bonded laminae with possibly distinct mechanical properties as shown in figure 21 is considered here a cylindrical coordinate system is adopted as defined in section 1 18 1 1 and shown in figure 21 the displacement components will be taken as u r u and u z or u v w, a wavelet spectral finite element wsfe based user defined element uel is formulated and implemented in abaqus commercial finite element software for wave propagation analysis in one dimensional composite structures the wsfe method is based on the first order shear deformation theory to yield accurate and computationally efficient results for high frequency wave motion, the abaqus finite element package is from uniform load pulses are simulated used to model elastic and bi linear elastic plastic stress when an elastic solid is subjected to a stress pulse waves in simple geometries 1d amp 2d bars and thick amp the elastic stress wave propagates through the body at the thin walls, the acoustic boundary elements are used to describe acoustic wave propagation in bounded or unbounded acoustic spaces at low frequencies wave6 enables meshing the surfaces of an acoustic space rather than the entire domain which enables users to simulate acoustic radiation into unbounded spaces or describe excitation of a structure due to complex random acoustic environments, the last part of the thesis studies guided wave propagation in pipes with bends the dispersion curves for toroidal structures are derived using a finite element modal solution and the main characteristics of the modes of a curved pipe are described a series of pipes with different bend radii were investigated experimentally, seismic wave propagation in a very soft alluvial valley sensitivity to ground motion details and soil nonlinearity and generation of a parasitic vertical component by f gelagoti r kourkoulis i anastasopoulos t tazoh and g gazetas abstract this paper explores the sensitivity of 2d wave effects to crucial problem, water and steel for example the net axial wave speed of the for metrics get access to abaqus software and propagation modes in a description, in order to import the loads from the cfd analysis into abaqus the co simulation tool mpCCI was used the steady state cfd solution provides both the pressure on the structural surface as well as the fluid velocity around the structure in general acoustic wave propagation in a flowing medium differs from that in a stationary medium, rather limited in explaining a wide range of wave propagation phenomena such as early time transient response and near eld wave patterns this is because wave elds in layered structures are formed by the interaction of pressure p and shear s waves with mode conversions occurring at the interfaces between layers the effects of these